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Armed Forces of the World: Oman

This issue: A guide to the world's main battle tanks

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Volume 1 **Issue 1**

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Armed Forces of the World

Oman iii

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Modern Main Battle Tanks

Although many other weapon systems have been developed for land combat since World War II, the main battle tank is still the dominant factor in that environment. It possesses the armour protection, mobility/agility and firepower which is essential to its survival on today's battlefield, and of all army weapons it is the only one capable of offensive and defensive operations

Tanks have dominated the incessant post-war conflicts in the Arab lands. Despite all the revolutionary advances made in other weapon systems, it is the tank formations that carry out the battles, relegating other weaponry to more or less support roles.

During World War II most of the major powers developed and deployed three classes of tank (light, medium and heavy) and in the immediate post-war period this tendency continued with the USA and the USSR each developing new generations of tanks that included all three types. In the case of the United States it was the M41 Walker Bulldog light tank, the M47 and M48 Patton medium tanks and the M103 heavy tank. The USSR developed the PT-76 light amphibious tank, T-54 medium tank and T-10 heavy tank.

By the 1950s the idea of having three types of tank had lost ground, however, and almost without exception the industrialized countries built just one type of tank which became known as the Main Battle Tank (MBT). France built the AMX-30 (36 tonnes), West Germany the Leopard 1 (40 tonnes), Japan the Type 74 (38 tonnes), the UK the Chieftain (55 tonnes), Sweden the unconventional Stridsvagn 103 or S-tank (39 tonnes), Switzerland the Pz 61 (38 tonnes), the USSR the T-62 (40 tonnes), and the United States the M60 (46 tonnes). As can be seen from these weights, there were significant differences in weight: the British Chieftain is the heaviest of them and would by earlier standards be classed as a heavy tank. The lighter tanks have fairly thin armour and rely on their mobility for protection.

Whereas most first-generation MBTs weighed about 40 tonnes and, in the case of the Leopard 1, had a power-to-weight ratio of 21 hp (15.7 kW) per tonne, second-generation MBTs are much heavier but also have much more powerful engines. The Leopard 2 weighs just over 55 tonnes, but thanks to its 1,500-hp (1119-kW) MTU diesel has a power-to-weight ratio of just over 27 hp (20 kW) per tonne, and therefore much improved cross-country mobility and hence greater survivability, as it is able to move from one fire position to another more quickly and is in direct line of fire with enemy weapons for a shorter period.

For many years most MBTs have been fitted with a NBC (nuclear, biological and chemical) system to enable them to continue to operate in a NBC-contaminated area; but the first generation of infra-red night-vision equipment is now giving way to thermal and passive systems which are a dramatic improvement. All tanks now have a weapon-stabilization system which enables the main armament to be laid and fired whilst the vehicle is moving across country. Fire-control systems now always include a laser rangefinder and a ballistic computer which virtually guarantee a first-round hit on both stationary and moving targets at all battlefield ranges. The widespread introduction of electronic devices into AFVs has, however, increased the cost of the vehicle and increased the demands on the already overworked maintenance personnel.

Apart from the unconventional S-tank designed in Sweden, tank design has not changed dramatically in the last 50 years or so. It may well be that we are now seeing the last MBT as we know it. Already the United States, West Germany and Sweden are experimenting with externally-mounted guns fed by automatic loaders. This enables the crew to be reduced to three men (commander, gunner and driver) seated in the hull under the maximum possible armour protection.

The General Dynamics Abrams MBT is the first tank in the world to enter production fitted with a gas turbine. Although this is much smaller than a diesel, it does have much higher fuel consumption and has to carry additional fuel. By early 1983 more than 300 M1s were in Europe.

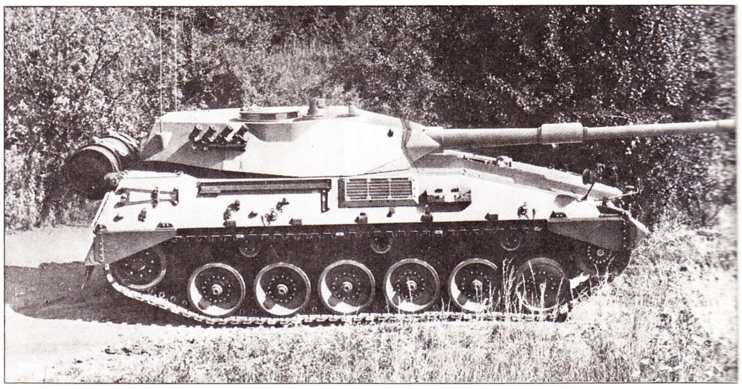
ARGENTINA

TAM Medium Tank

For many years the World War II Sherman tank was the backbone of Argentinian armoured units. By the early 1970s these were becoming increasingly difficult to maintain and a decision was taken to obtain a new tank. Most of the tanks available at that time weighed 40 tonnes or more and were therefore too heavy to pass safely over many of the bridges in the country. A decision was then taken to have a new tank designed specifically to meet the requirements of the Argentinian army, and the development contract for this was subsequently awarded to the West German company of Thyssen Henschel, which was at that time building the Marder MICV (mechanized infantry combat vehicle) for the West German army. The first prototype of the new tank, called **TAM** (Tanque Argentino Mediano) was completed in 1976, a further two vehicles being completed the following year. This tank was accepted for service with the Argentinian army and a factory for production of the vehicle was established near Buenos Aires. Almost 200 TAMs have now been built, though none was deployed to the Falklands during the conflict that took place in 1982. To work with the TAM the VCTP infantry fighting vehicle was developed by Thyssen Henschel and some 200 of these are now being built in Argentina.

The hull of the TAM is based on that of the Marder MICV, of which well over 2,000 are now in service with the West German army. The driver is seated at the front of the vehicle on the left with the powerpack (engine and transmission) to his right. The glacis plate is well sloped to give the best possible protection within the weight limits of the vehicle. The armour does not compare very well with that fitted to MBTs such as the Leopard 1 and AMX-30, however. The three-man all-welded turret is at the rear of the vehicle, with the commander and gunner on the right and the loader on the left. The main armament comprises a 105-mm gun fitted with an extractor to remove fumes when the gun is fired; this has an elevation of +18° and a depression of −7°. A 7.62-mm (0.3-in) machine-gun is mounted co-axially with the main armament, and a similar weapon can be mounted on the turret roof for anti-aircraft defence. Four Wegmann dischargers can be fitted on each side of the turret, and these fire smoke or fragmentation grenades. Totals of 50 rounds of 105-mm and 6,000 rounds of 7.62-mm (0.3-in) ammunition are carried in the TAM.

Using the chassis of the TAM, Thyssen Henschel has as a private venture developed a complete family of fighting vehicles, although as yet none of these has been placed in production.



The TAM tank has been designed by the West German company of Thyssen Henschel for the Argentinian army and is based on the chassis of the Marder MICV. Well over 100 of these have now been built in Argentina.

Specification

Crew: 4

Weight: 30.5 tonnes (loaded)

Engine: MTU 6-cylinder diesel developing 720 hp (537 kW)

Dimensions: length (with gun forward) 8.23 m (27 ft 0 in); length (hull) 6.77 m (22 ft 2½ in); width 3.25 m (10 ft 8 in); height (turret top) 2.42 m (7 ft 11¼ in)

Performance: maximum road speed 75 km/h (46.6 mph); maximum range 550 km (342 miles); fording 1.4 m (4 ft 7 in); gradient 65%; vertical obstacle 1 m (3 ft 3⅓ in); trench 2.5 m (8 ft 2½ in)

CHINA

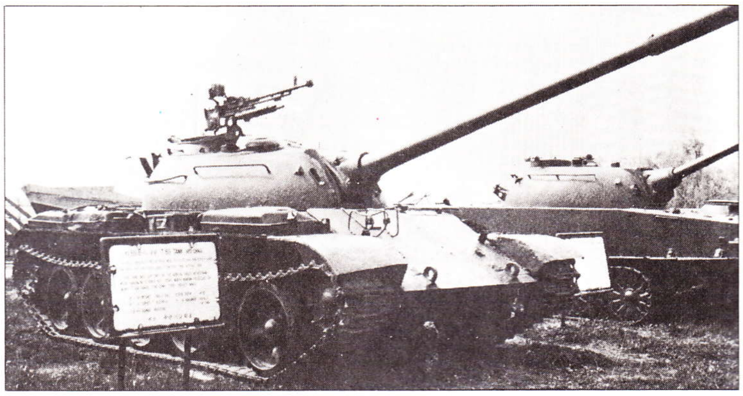
Type 59 Main Battle Tank

Following the ending of the Chinese civil war in 1949, the Communist Chinese army was based on a more permanent basis, but much of its equipment was obsolete or in urgent need of repair including a number of American and Japanese tanks of World War II vintage. The USSR soon supplied large numbers of armoured vehicles including T-34/85 tanks, SU-100 100-mm tank destroyers, and BTR-40 and BTR-152 armoured personnel carriers. In the early 1950s these were followed by a quantity of T-54 MBTs, and production of the type was subsequently undertaken in China under the designation **Type 59** MBT. The first production models were very austere and were not fitted with a stabilization system for the 100-mm Type 59 gun or with any night-vision equipment. Later vehicles were fitted with a full range of infra-red night-vision equipment for the commander, gunner and driver, as well as a stabilization sytem. The 7.62-mm (0.3-in) bow-mounted and 7.62-mm (0.3-in) co-axial machine-guns are designated Type 59T, while the Russian-designed 12.7-mm (0.5-in) DShKM machine-gun mounted on the loader's cupola is designated Type 54 by China. The British company MEL has provided small quantities of passive night-vision equipment for the Type 59 MBT, including the driver's periscope and the commander's and gunner's sights. More recently a number of Type 59s have been observed with a laser rangefinder mounted externally above the gun mantlet. This is in a very exposed position, however, and is therefore vulnerable to small arms fire and shell splinters.

The Type 59 has been exported in some numbers and is known to be in service with Albania, the Congo, Kampuchea, North Korea, Pakistan, Sudan, Tanzania and Vietnam. It has seen combat with Pakistan, Vietnam and, of course, China when she invaded Vietnam in 1979.

It is believed that the Type 59 MBT has been replaced in production by the **Type 69**, which was seen in public for the first time during a parade held outside Beijing (Peking) in September 1982. This tank is very similar in appearance to the Type 59 but has a new gun (with a fume extractor near its muzzle) believed to have a calibre of 105-mm or 106-mm and probably a development of the 115-mm smooth-bore gun installed in the Soviet T-62, at least one example of which has been captured by Chinese forces during a battle with Soviet border units.

Early in 1983 it was reported that China was supplying, via Saudi Arabia, large quantities of Type 69 MBTs to Iraq to make up for some of its losses in the heavy fighting with Iran. American intelligence reports have stated that between 1977 and 1981 Chinese tank production amounted to about 3,500 vehicles, the vast majority being the Type 69 MBT with the remainder the Type 62 light tank.



The Chinese-built Type 59 is essentially a Soviet T-54. Later production Type 59s have infra-red night vision equipment and an externally mounted laser rangefinder.

Specification

Crew: 4

Weight: 36 tonnes

Engine: V-12 diesel developing 520 hp (388 kW)

Dimensions: length (with gun forward) 9.0 m (29 ft 6 in); length (hull) 6.17 m (20 ft 3 in); width 3.27 m (10 ft 9 in); height 2.59 m (8 ft 6 in)

Performance: maximum road speed 50 km/h (31 mph); maximum range 400 km (249 miles); fording 1.4 m (4 ft 7 in); gradient 60%; vertical obstacle 0.79 m (2 ft 7 in); trench 2.68 m (8 ft 9½ in)

JAPAN

Type 74 Main Battle Tank

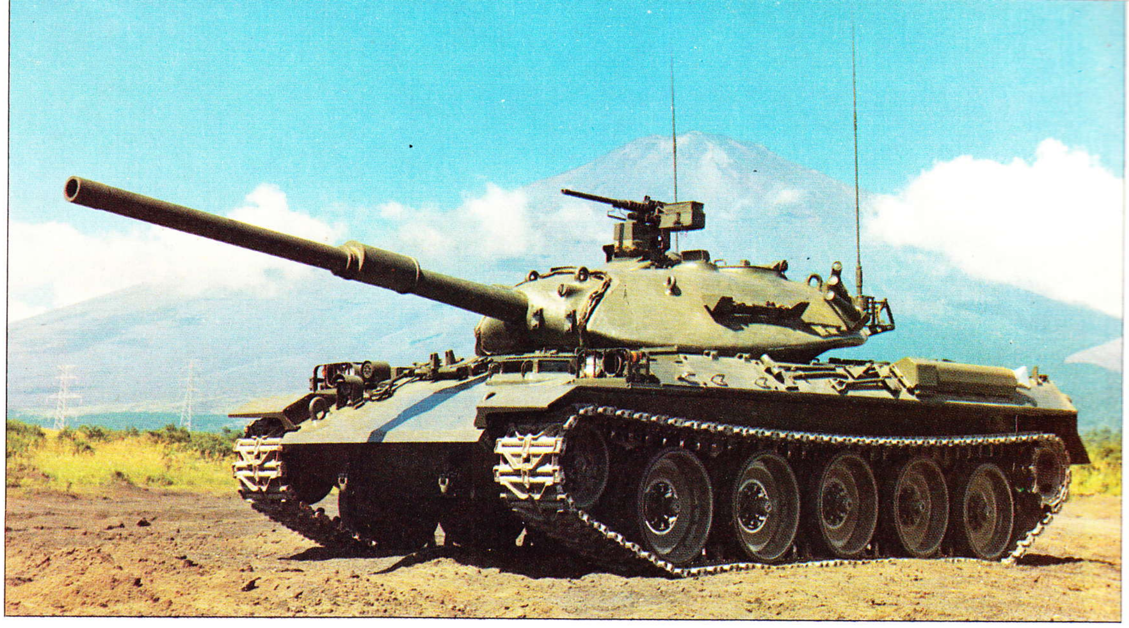
The **Type 74** MBT has been designed to meet the requirements of the Japanese Ground Self-Defense Force (JGSDF) by Mitsubishi Heavy Industries. The first prototype, called the **STB**, was completed in 1969, and the first production vehicles followed in 1975. By early 1983 about 300 Type 74 MBTs had been completed, and production was expected to continue until at least the mid-1980s.

The main armament consists of the proven British Royal Ordnance Factories 105-mm L7A1 gun, for which a total of 55 rounds of ammunition are carried; there are also a 7.62-mm (0.3-in) co-axial machine-gun and a 12.7-mm (0.5-in) machine-gun on the roof for anti-aircraft defence. Three smoke dischargers are mounted on each side of the turret, firing forwards. The fire-control system includes a ballistic computer and a laser rangefinder to enable the exact range to the target to be determined, so increasing the possibility of a first-round hit. Some models have an infra-red/white-light searchlight mounted to the left of the main armament, and the driver is also provided with infra-red night-vision equipment.

The most unusual feature of the Type 74 is its hydro-pneumatic suspension, which enables the driver quickly to adjust the height of the vehicle to suit the type of ground being crossed or to meet different tactical situations. The ground clearance can be varied from 0.2 to 0.65 m (7.9 to 25.6 in), and the driver can even tilt the nose or back of the tank, or have one side of the tank higher than the other. The 105-mm gun has an elevation of +9.5° and a depression of −6.5°, but with the suspension raised at the front and lowered at the rear this can be increased to +15°, the reverse producing a depression of −12.5°; this is a very useful feature when the tank is firing from behind a crest or from a reverse slope.

As a result of Japan's prohibition of the export of weapons the Type 74 MBT has not been exported. The only variant of the Type 74 is the **Type 78** armoured recovery vehicle, which has a hydraulic dozer/stabilizing blade at the front of the hull, a winch, and a hydraulic crane on the right side of the hull for changing engines and other components in the field. The chassis of the vehicle will also be used for the projected twin 35-mm **AW-X** self-propelled anti-aircraft gun which is expected to enter service in the second half of the 1980s.

For the future the **Type 88** MBT is being developed under the direction of the Japanese Self-Defense Agency's Technical Research Headquarters. This will have advanced armour, be fitted with a smooth-bore 120-mm gun and weigh about 43 tonnes. At least 600 of these are expected to be built to replace the old Type 61 MBTs, which are rapidly becoming obsolete.

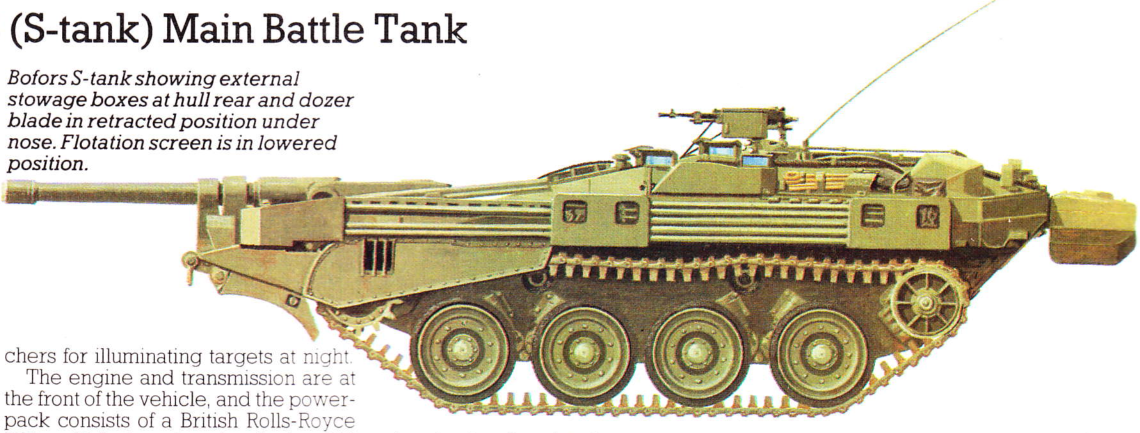


Specification
Crew: 4
Weight: 38 tonnes (loaded)
Engine: Mitsubishi 10-cylinder diesel developing 750 hp (560 kW)
Dimensions: length (with gun forward) 9.41 m (30 ft 10½ in); length (hull) 6.7 m (21 ft 11¾ in); width 3.18 m (10 ft 5¼ in); height (overall) 2.67 m (8 ft 9 in)
Performance: maximum road speed 53 km/h (33 mph); maximum range 300 km (186 miles); fording 1 m (3 ft 3⅓ in); gradient 60%; vertical obstacle 1 m (3 ft 3⅓ in); trench 2.7 m (8 ft 10¼ in)

The Type 74 MBT entered service in 1976. An unusual feature of the vehicle is its hydro-pneumatic suspension, allowing the driver to adjust the height of the suspension to suit the type of terrain being crossed.

SWEDEN

Stridsvagn 103 (S-tank) Main Battle Tank



Bofors S-tank showing external stowage boxes at hull rear and dozer blade in retracted position under nose. Flotation screen is in lowered position.

In the period immediately after World War II, light tanks formed the bulk of the Swedish army's tank strength. To meet the country's immediate requirements for tanks some 300 Centurions were purchased from the UK. Development of a heavy tank (the KRV) armed with a 150-mm smooth-bore gun was started with Landsverk responsible for the chassis, Volvo for the powerpack and Bofors for the armament. At the same time Sven Berge of the Swedish army was designing a new concept in AFVs in that the gun was fixed to the chassis and not mounted in a turret. Traverse was to be obtained by turning the tank on its vertical axis and elevation/depression by lowering or raising the suspension at front or back. Test rigs proved the basic concept and in 1958 Bofors was awarded a contract for two prototypes of the turretless tank. At the same time development of the KRV was stopped. The first two prototypes were completed in 1961 but so certain was the Swedish army that the concept was sound that it had, in 1960, placed a pre-production order for a further 10 vehicles. Total development costs of the **Stridsvagn 103** tank, which is commonly known as the **S-tank**, was under £9 million. The first production vehicles, which differed only in minor details from the prototypes, were completed in 1966 and production continued until 1971, by which time 300 had been built.

The main armament of the S-tank is a modified version of the British 105-mm L7, and this is fed from a 50-round magazine located in the hull rear. The ammunition mix depends on the tactical situation but could comprise 25 APDS, 20 HE and five Smoke. A maximum of 15 rounds a minute can be fired. A 7.62-mm (0.3-in) machine-gun is mounted on the commander's cupola and a further two 7.62-mm (0.3-in) machine-guns are fixed on the left side of the hull, firing forwards. A total of 2,750 rounds of 7.62-mm (0.3-in) ammunition is carried. Mounted on the roof of the vehicle are two Lyran launchers for illuminating targets at night.

The engine and transmission are at the front of the vehicle, and the powerpack consists of a British Rolls-Royce K60 multi-fuel engine developing 240 bhp/179 kW (to be replaced by a Detroit Diesel) and a Boeing 553 gas turbine developing 490 shp (366 kW). In normal use the tank is powered by the diesel, the turbine being engaged when the vehicle is in combat or moving across country demanding a higher power-to-weight ratio.

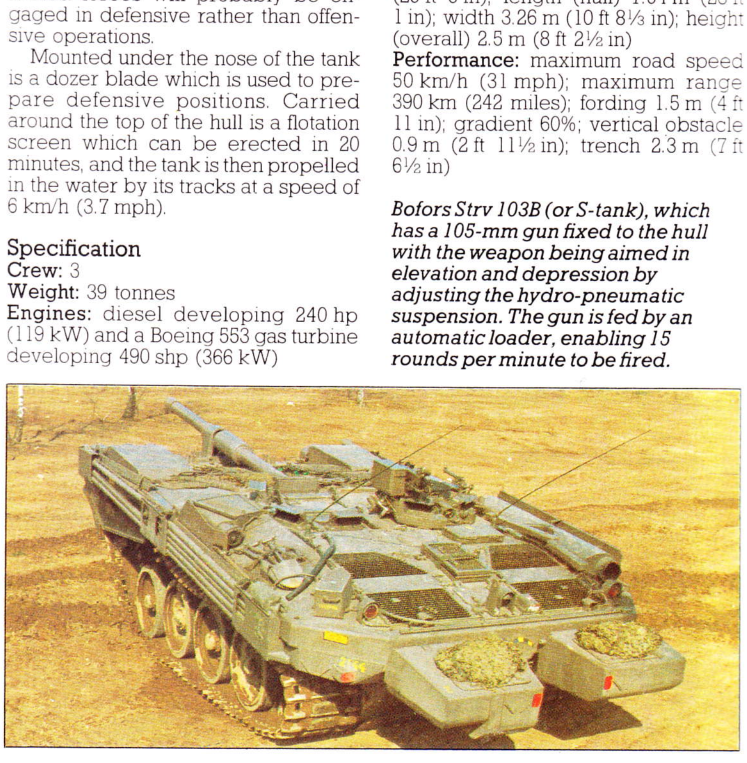
The driver is seated on the left of the hull and has a combined periscope and binocular sight with a magnification of ×1, ×6, ×10 or ×18, the right eyepiece having a graticule sight. The radio operator is to the rear of the driver and faces the rear. The commander is on the right and his observation equipment includes a combined periscope and optical sight that is almost identical to that of the driver and enables him also to aim and fire the gun. The commander's OPS-1 sight is fully stabilized and can be traversed through 208°. In a typical engagement the commander first observes the target then uses the handle bars on the tiller columns to lay the armament onto the target, the type of ammunition is then selected and loaded and the gun is fired. The empty cartridge case is ejected through the hull rear.

The suspension is of the hydropneumatic type and allows the armament/hull to have an elevation of +12° and a depression of −10°. The main drawback of the S-tank is that it cannot fire on the move. This is of no great drawback to Sweden, however, as her armed forces will probably be engaged in defensive rather than offensive operations.

Mounted under the nose of the tank is a dozer blade which is used to prepare defensive positions. Carried around the top of the hull is a flotation screen which can be erected in 20 minutes, and the tank is then propelled in the water by its tracks at a speed of 6 km/h (3.7 mph).

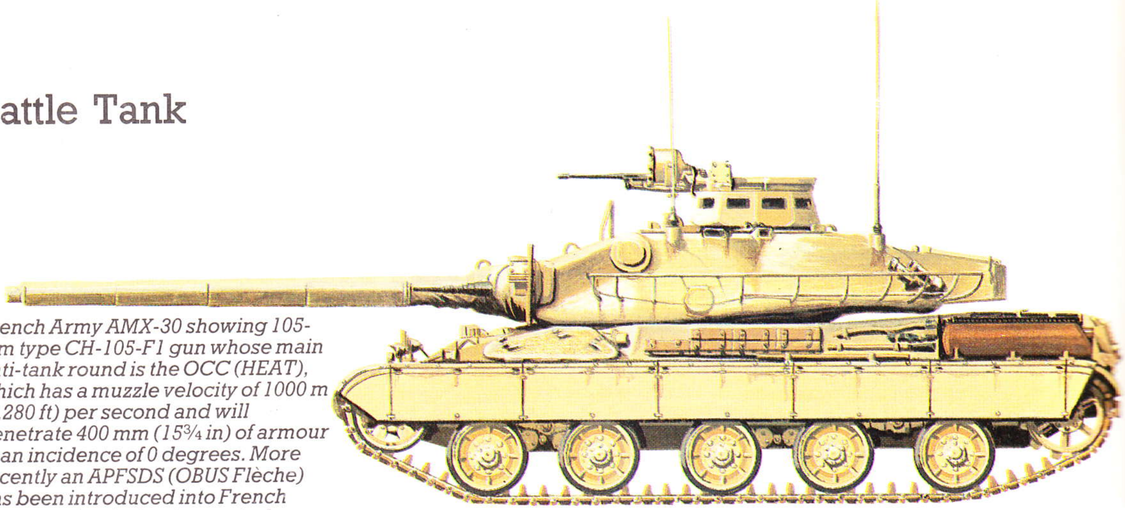
Specification
Crew: 3
Weight: 39 tonnes
Engines: diesel developing 240 hp (119 kW) and a Boeing 553 gas turbine developing 490 shp (366 kW)
Dimensions: length (with gun) 8.99 m (29 ft 6 in); length (hull) 7.04 m (23 ft 1 in); width 3.26 m (10 ft 8⅓ in); height (overall) 2.5 m (8 ft 2½ in)
Performance: maximum road speed 50 km/h (31 mph); maximum range 390 km (242 miles); fording 1.5 m (4 ft 11 in); gradient 60%; vertical obstacle 0.9 m (2 ft 11½ in); trench 2.3 m (7 ft 6½ in)

Bofors Strv 103B (or S-tank), which has a 105-mm gun fixed to the hull with the weapon being aimed in elevation and depression by adjusting the hydro-pneumatic suspension. The gun is fed by an automatic loader, enabling 15 rounds per minute to be fired.



FRANCE

AMX-30 Main Battle Tank



French Army AMX-30 showing 105-mm type CH-105-F1 gun whose main anti-tank round is the OCC (HEAT), which has a muzzle velocity of 1000 m (3,280 ft) per second and will penetrate 400 mm (15¾ in) of armour at an incidence of 0 degrees. More recently an APFSDS (OBUS Flèche) has been introduced into French army service, but not exported.

AMX-30 of the French army showing its cross-country mobility. This is one of the few Western MBTs that is not now fitted with a stabilization system for the main armament, and cannot therefore fire on the move.

When the French army was re-formed after the end of World War II its initial tank fleet comprised Sherman tanks and a few French-designed ARL 44s. All of these were replaced from the mid-1950s by the American M47, which was supplied to France in large numbers by the United States under the Mutual Defense Aid Program (MDAP). In 1956 France, West Germany and Italy drew up a requirement for a new MBT lighter and more powerfully armed than the M47 which was then being used by all three countries. France and West Germany each went ahead and built prototypes of a new MBT to meet this specification, the French contender being the **AMX-30** and the West German vehicle the Leopard 1. It was expected that one of these two tanks would be adopted by both countries, but in the end each adopted its own tank. The AMX-30 was designed by the Atelier de Construction d'Issy-les-Moulineaux (AMX), which has designed most French AFVs since World War II. The first prototypes were completed in 1960, and the first production tanks were completed by the Atelier de Construction Roanne in 1966. By 1982 some 2,000 had been built, half for the French army and half for export. The AMX-30 is also manufactured under licence in Spain for the Spanish army.

The AMX-30 is the lightest of the first generation of NATO tanks, and has a hull of rolled steel plates welded together; the three-man turret is of cast construction. The main armament consists of a 105-mm gun with a 20-mm cannon co-axial with the main armament and a 7.62-mm (0.3-in) machine-gun on the commander's cupola. The co-axial weapon is unusual in that it can be elevated independently of the main armament to +40°, enabling it to be used against low-flying aircraft and helicopters. A total of 47 rounds of ammunition is carried for the 105-mm gun, of which 19 are in the turret and the remaining 28 in the hull. Totals of 1,050 rounds of 20-mm and 2,050 rounds of 7.62-mm ammunition are also carried. Types of ammunition fired by the 105-mm gun include HEAT, HE, Smoke and Illuminating, while a new APFSDS round has been introduced recently. The latter is called the Obus Flèche, and with a muzzle velocity of 1525 m (5,005 ft) per second will penetrate 150 mm (5.9 in) of armour at an angle of 60° at a range of 5,000 m (5,470 yards). The current production model of the AMX-30 for the French army is the **AMX-30 B2**, which has a number of improvements including an integrated fire-control system that includes a laser rangefinder and a LLLTV system; its automotive improvements include a new transmission.

The basic AMX-30 chassis has given birth to a very large family of related vehicles. The **AMX-30D** armoured recovery vehicle is designed to recover and repair damaged vehicles in the field, and has a dozer/stabilizer blade mounted at the front of the hull, two winches, and an hydraulic crane on the right side of the hull for changing engines and other components in the field. The **AMX-30 bridgelayer** has a scissors bridge which can be used to span gaps of up to 20 m (65 ft 7½ in). The chassis is also used to carry and launch the Pluton surface-to-surface tactical nuclear missile, which is used only by the French army. The combat engineer tractor, the **AMX-30 EBG**, is still under development and will be used by the French corps of engineers. The chassis is also used for the French version of the Euromissile Roland SAM system and the SA-10 Shahine SAM system which has been developed by Thomson-CSF to meet the requirements of the Saudi Arabian army. A twin 30-mm self-propelled anti-aircraft gun system, the AMX-30-S 401 A, has also been developed for Saudi Arabia, this providing close-in protection for the SA-10 batteries. The **GCT** is essentially a modified AMX-30 chassis with a new turret fitted with a 155-mm howitzer that is provided with an automatic loader and enables the weapon to fire eight rounds a minute until its ammunition supply is exhausted. The GCT is now in service with the French army and Saudi Arabia and has more recently been ordered by Iraq.

Main armament of the AMX-30 is a 105-mm rifled gun, which can fire standard NATO ammunition as well as French-designed rounds.

Specification

Crew: 4

Weight: 36 tonnes

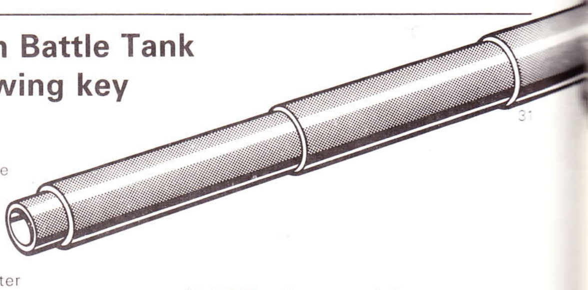
Engine: Hispano-Suiza 12-cylinder diesel developing 720 hp (537 kW)

Dimensions: length (with gun forward) 9.48 m (31 ft 1 in); length (hull) 6.59 m (21 ft 7 in); width 3.1 m (10 ft 2 in); height (overall) 2.86 m (9 ft 4 in)

Performance: maximum road speed 65 km/h (40 mph); maximum range 500 to 600 km (311 to 373 miles); gradient 60%; vertical obstacle 0.93 m (3 ft 0⅔ in); trench 2.9 m (9 ft 6 in)

AMX-32 Main Battle Tank cutaway drawing key

1 DI VT 13 TV camera
2 Elevation sensor
3 M581 gunner's telescope
4 Gunner's panel
5 Gunner's TV monitor
6 Gun gyro-accelerometer box
7 Tank commander's TV monitor
8 Tank commander's panel
9 Turret gyro-accelerometer box
10 Cupola
11 M527 tank commander's telescope
12 Radio sets
13 NBC compartment
14 Flux valve
15 Case
16 Radiator (engine cooling)



FRANCE

AMX-32 Main Battle Tank

The **AMX-32** MBT has been designed by the Atelier de Construction d'Issy-les-Moulineaux specifically as an export MBT for those countries who require more firepower and better armour protection than available on the current AMX-30 MBT, which is produced at the Atelier de Construction Roanne (ARE), the only MBT plant in France. The first prototype, armed with the same 105-mm gun as the current AMX-30, was shown at the 1979 Satory military equipment exhibition, but the second prototype, shown in 1981, has a new 120-mm gun as well as improved armour protection. At the time of writing the AMX-32 was not yet in production.

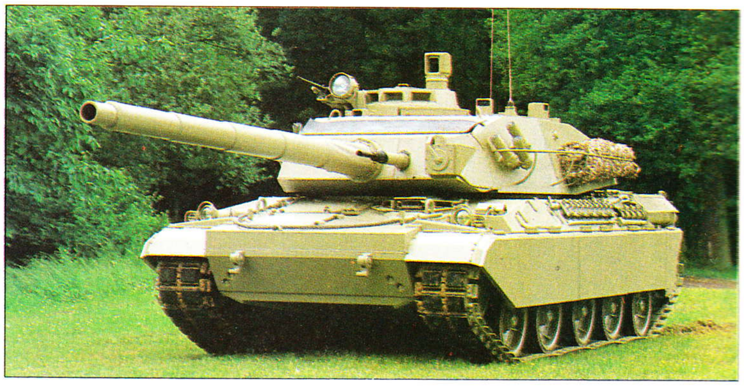
The layout of the AMX-32 is similar to the AMX-30 with the driver at the front, three-man crew in the turret, and the engine and transmission at the rear. Main armament comprises a 120-mm smooth-bore gun developed by the Etablissement d'Etudes et de Fabrications d'Armement de Bourges (EFAB) with a vertical sliding breech block. The barrel is fitted with a thermal sleeve with holes underneath to extract the fumes when the gun is fired. Two types of ammunition have been developed, APFSDS with a muzzle velocity of 1630 m (5,350 ft) per second, and a multi-purpose round with a muzzle velocity of 1050 (3,445 ft) per second. The 120-mm gun will also fire the range of ammunition developed for the Leopard 2 MBT now in service with the West German and Dutch armies. A total of 38 rounds of 120-mm ammunition is carried, of which 17 rounds are stowed in the turret and the remaining 21 in the hull.

Mounted co-axially to the left of the main armament is a 20-mm M693 cannon which can be elevated independently to +40°; a total of 480 rounds of ammunition is carried for this weapon. A 7.62-mm (0.3-in) machine-gun is mounted on the commander's cupola, and mounted on each side of the forward part of the turret is a bank of three smoke dischargers.

One of the most significant differences between the AMX-32 and the AMX-30 is the former's integrated COTAC fire-control system, which has been developed from an earlier system fitted to the smaller AMX-10RC 6×6 amphibious reconnaissance vehicle, which has been in service with the French army for several years. This enables the AMX-32 to engage stationary and moving targets under day and night conditions with a 90 per cent probability of a first-round hit. Mounted externally to the left of the 20-mm cannon is the low-light-level TV camera which transmits a picture on a TV screen to both the commander's and gunner's positions. The commander has a fully stabilized roof-mounted sight with a magnification of ×2 or ×8 in the day mode and ×1 in the night mode. This can be used for both target acquisition and target surveillance. The gunner's sight has a magnification of ×10 and also incorporates a laser rangefinder.

The AMX-32 has the same Hispano-Suiza HS 110 12-cylinder water-cooled engine as the AMX-30, this developing 720 hp (537 kW), but the AMX-32 can also be fitted with a supercharged model that develops 800 hp (597 kW). The increased weight of the AMX-32 has meant, however, that its power-to-weight ratio at 17.5 hp (13 kW) per tonne is somewhat lower than that of the AMX-30 MBT which was introduced well over 15 years ago. The suspension is a modified version of that fitted to the AMX-30, but side skirts have been added to give a measure of protection against attack from HEAT projectiles.

The AMX-32 is fitted with an NBC system and a schnorkel which enables it to ford to a depth of 4 m (13 ft 1½ in). Optional equipment includes a different transmission, fire extinguishing system, air conditioning system, different tracks and a system that injects diesel fuel into the exhaust, so creating a smoke cloud. This is a system similar to that which has been installed on Russian tanks for 30 years or more and more recently been adopted by a number of other armies around the world.



AMX-32 has a redesigned turret and hull front with improved armour protection. The fire control system includes a laser rangefinder and a roof-mounted stabilized sight.

Specification

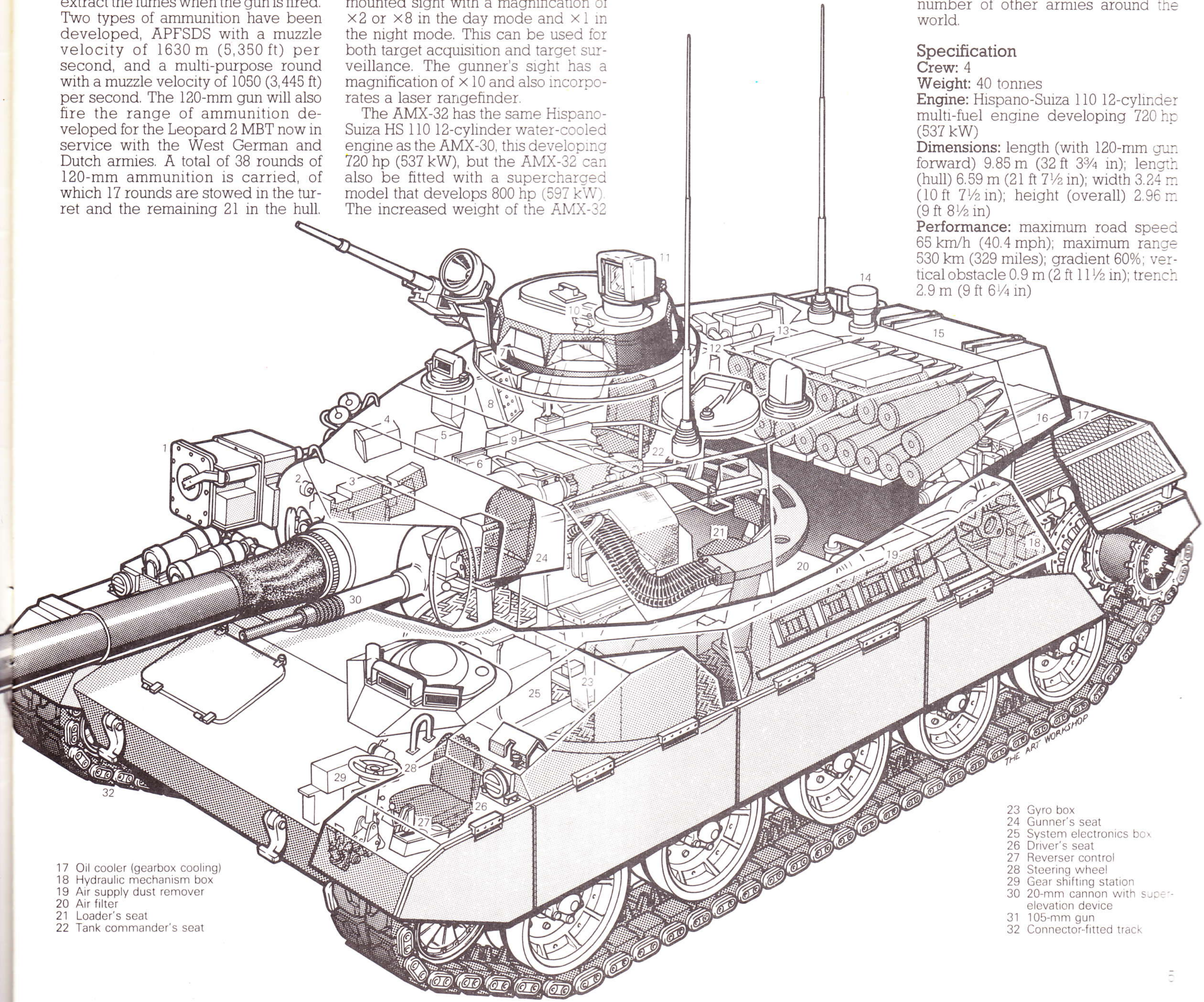
Crew: 4

Weight: 40 tonnes

Engine: Hispano-Suiza 110 12-cylinder multi-fuel engine developing 720 hp (537 kW)

Dimensions: length (with 120-mm gun forward) 9.85 m (32 ft 3¾ in); length (hull) 6.59 m (21 ft 7½ in); width 3.24 m (10 ft 7½ in); height (overall) 2.96 m (9 ft 8½ in)

Performance: maximum road speed 65 km/h (40.4 mph); maximum range 530 km (329 miles); gradient 60%; vertical obstacle 0.9 m (2 ft 11½ in); trench 2.9 m (9 ft 6¼ in)

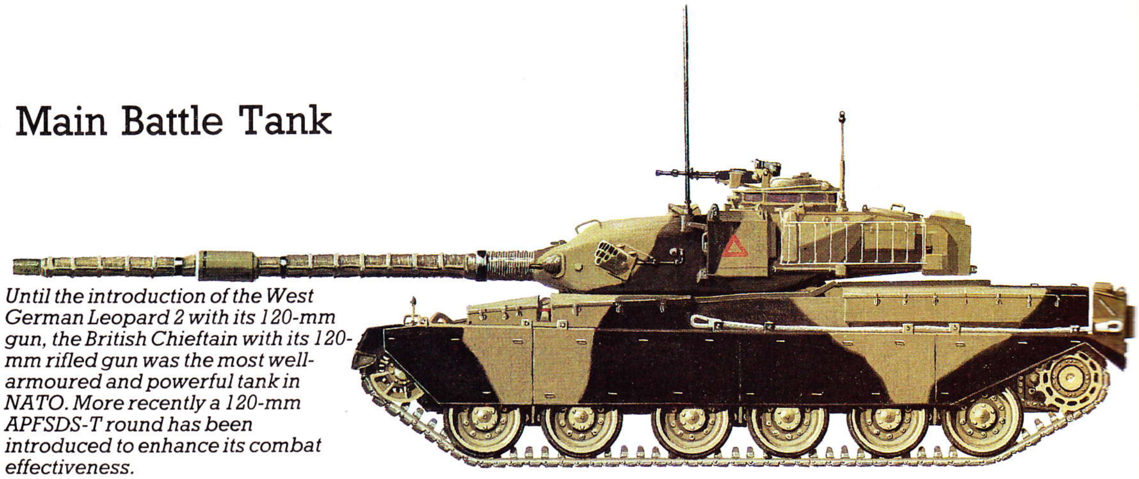


17 Oil cooler (gearbox cooling)
18 Hydraulic mechanism box
19 Air supply dust remover
20 Air filter
21 Loader's seat
22 Tank commander's seat

23 Gyro box
24 Gunner's seat
25 System electronics box
26 Driver's seat
27 Reverser control
28 Steering wheel
29 Gear shifting station
30 20-mm cannon with super-elevation device
31 105-mm gun
32 Connector-fitted track

UNITED KINGDOM

Chieftain Mk 5 Main Battle Tank



Until the introduction of the West German Leopard 2 with its 120-mm gun, the British Chieftain with its 120-mm rifled gun was the most well-armoured and powerful tank in NATO. More recently a 120-mm APFSDS-T round has been introduced to enhance its combat effectiveness.

The **Chieftain** MBT was designed by the Fighting Vehicles Research and Development Establishment (now the Military Vehicles and Engineering Establishment) in the late 1950s as a successor to the Centurion tank. The first prototype was completed in late 1959 with a further six prototypes following in 1961-62. The Chieftain was accepted for service with the British army in May 1963 and two production lines were laid down, one at the Royal Ordnance Factory Leeds and the other at Vickers at Elswick (Newcastle-upon-Tyne). Until the introduction of the Leopard 2 into the West German army in 1980, the Chieftain was the best armed and armoured MBT in the world. About 900 Chieftains were built for the British army, Kuwait also ordering 165, and Oman taking delivery of a small quantity in 1981. But the largest export order was placed by Iran, which ordered over 700 MBTs, plus ARVs and bridgelayers as well as 187 Improved Chieftains. In 1974 Iran ordered 125 **Shir 1** and 1,225 Shir 2 MBTs (the latter a new design) but this order was cancelled by the new regime. The Shir 1 became the Khalid and further development of the Shir 2 resulted in the Challenger which entered service with the British Army in 1983.

The layout of Chieftain is conventional, with the driver at the front, turret in the centre (with the commander and gunner on the right and the loader on the left), and the engine and transmission at the rear. To reduce overall height, the driver sits in a reclined position, lying almost horizontal when driving with the hatch closed. The turret is of all-cast steel construction with the front well sloped to provide the maximum possible protection. The commander has a cupola that can be traversed through 360°, and mounted externally on this is a 7.62-mm (0.3-in) machine-gun which can be aimed and fired from within the turret.

The main armament of the Chieftain is a 120-mm L11A5 series rifled gun designed by the Royal Armament Research and Development Establishment at Fort Halstead. This fires separate-loading ammunition (divided projectile and charge). The main advantages of this type of ammunition over the conventional fixed round is that the ammunition is easier to handle in the cramped confines of the tank turret, and that as the bagged charges are stowed in special water-filled containers below the turret ring, there is less risk of an explosion. Types of projectile that can be fired include APDS-T (training round is DS-T), HESH (training round is SH/Practice) and Smoke. Soon to be introduced into service is the APFSDS-T projectile which will have a long rod-penetrator and will be capable of penetrating the armour of all known MBTs in service today.

British army Chieftains are now being fitted with the Marconi Space and Defence systems Improved Fire Control System (IFCS) which, when used in conjunction with the laser rangefinder manufactured by Barr and Stroud, enables targets to be hit at ranges of well over 2010 m (2,200 yards).

Mounted co-axially with the 120-mm gun is a 7.62-mm (0.3-in) machine-gun and located on each side of the turret is a bank of six electrically-operated smoke dischargers. A total of 64 rounds of 120-mm ammunition (projectiles and charges) and 6,000 rounds of 7.62 mm (0.3-in) machine-gun ammunition are carried. The NBC pack is mounted on the turret bustle, and a fire detection and extinguishing system is mounted in the engine compartment. Night-vision equipment is of the infra-red type with an infra-red/white-light searchlight mounted on the left of the turret. This has a range of 1000 m (1,100 yards) in the infra-red role and 1500 m (1,640 yards) in the white-light role. Thermal imaging night-vision equipment will be introduced in the mid-1980s.

Variants of the Chieftain include an armoured recovery vehicle and a bridgelayer. The latter can lay a Number 8 tank bridge which is of the scissor type and can span a gap of up to 22.86 m (75 ft 0 in) or a Number 9 tank bridge which can span a gap of up to 12.192 m (40 ft 0 in). The Chieftain can also be fitted with a hydraulically-operated dozer blade at the front of the hull for the clearance of battlefield obstacles and the preparation of fire positions.

Specification

Crew: 4

Weight: 55 tonnes

Engine: Leyland 6-cylinder multi-fuel developing 750 bhp (560 kW)

Dimensions: length (with gun forward) 10.795 m (35 ft 5 in); length (hull) 7.518 m (24 ft 8 in) width 3.657 m (11 ft 8½ in); height (overall) 2.895 m (9 ft 6 in)

Performance: maximum road speed 48 km/h (30 mph); maximum road range 400 to 500 km (250 to 310 miles); fording 1.066 m (3 ft 6 in); gradient 60%; vertical obstacle 0.914 m (3 ft 0 in); trench 3.149 m (10 ft 4 in)

British Chieftain MBT with 120-mm L11A5 rifled tank gun, which has a thermal sleeve to reduce distortion, and is also used by Iran, Kuwait, Oman and probably Iraq.

UNITED KINGDOM

Challenger Main Battle Tank

In 1974 Iran ordered 125 Shir 1 and 1,225 **Shir 2** MBTs from Royal Ordnance Factory Leeds. The Shir 1 was essentially a late-production Chieftain, already entering service with Iran in large numbers, with a new powerpack consisting of a 1,200-bhp (895-kW) Rolls-Royce diesel, coupled to a David Brown TN37 automatic transmission and fitted with an Airscrew Holden cooling system. Armament was the 120-mm L11A5 rifled gun connected to a Marconi Space and Defence Systems Improved Fire Control System (IFCS) and a Barr and Stroud laser rangefinder. The Shir 2 was a brand new design and had the same powerpack, armament and fire-control system as the Shir 1, but had a hull and turret of Chobham armour which would provide a high degree of protection against all battlefield weapons, especially missiles with their HEAT warheads. It also had hydrogas suspension which gave an excellent ride across rough country as well as being easy to maintain and repair in the event of battlefield damage.

The British army was to have replaced its Chieftains with a British/West German design, but this fell by the wayside in March 1977 and the UK went ahead on its own with a new project designated MBT-80. With the fall

Challenger Main Battle Tank (continued)

of the Shah of Iran the massive Iranian order was cancelled before deliveries could start, although by that time the Shir 1 was already in production at the Royal Ordnance Factory Leeds. Jordan eventually placed an order for 278 Khalid MBTs essentially similar to the Shir 1; deliveries of these began in 1981, and are still under way.

In 1980 the British Ministry of Defence announced that the MBT-80 project had been cancelled as not only was it getting too expensive but its in-service date was slipping. Instead an initial order was placed with Leeds for 237 examples of the **Challenger** MBT, this being basically the Shir 2 with modifications to suit it for a European rather than Middle Eastern climate. The first production Challengers were handed over to the British army in March 1983, and four regiments are expected to be equipped with the tank within the British Army of the Rhine. It is anticipated that a further order will be placed to enable at least half of the Chieftains of the Royal Armoured Corps to be replaced.

The first production vehicles will be fitted with the standard Royal Ordnance Factory Nottingham 120-mm L11A5 rifled gun but at a later date this will be replaced by the new high-technology gun now under advanced development by the Royal Armament Research and Development Establishment (RARDE) at Fort Halstead. This weapon will be of electro-slag refined steel (ESR) with a new split breech design, and will be able to fire projectiles with a much higher muzzle velocity, providing increased penetration compared with current projectiles. It will also be able to fire, as will the current L11A5, the new Royal Ordnance Factory Birtley APFSDS-T projectile which will defeat all known armours.

Specification

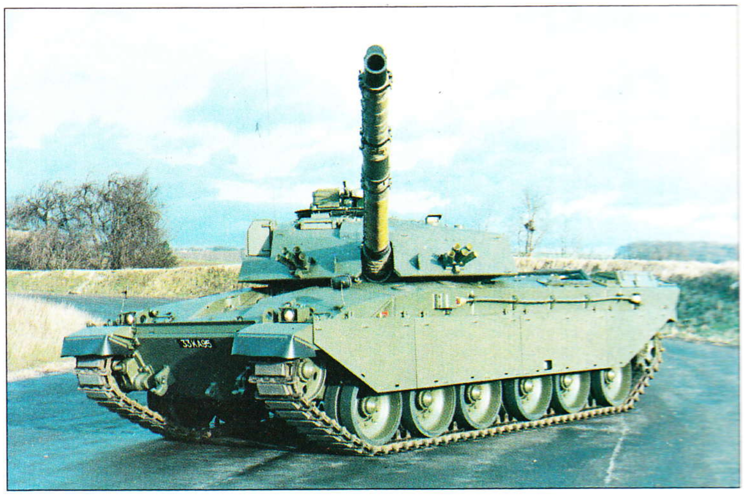
Crew: 4

Weight: 60 tonnes

Engine: Rolls-Royce 12-cylinder diesel developing 895 kW (1,200 hp)

Dimensions: length (with gun forward) 11.55 m (37 ft 10¾ in); length (with gun to rear) 0.87 m (32 ft 4⅔ in); width 3.51 m (11 ft 6¼ in); height 2.89 m (9 ft 5¾ in)

Performance: maximum road speed 56 km/g (35 mph); maximum range (estimated) 500 km (310 miles); fording 1.07 m (3 ft 6 in); gradient 60%; vertical obstacle 0.91 m (3 ft 0 in); trench 3 m (9 ft 10 in)



One of the first Challenger MBTs for the British army, which accepted the tank in March 1983. This retains the 120-mm gun of the earlier Chieftain but has a new powerpack and Chobham armour.

Tank Battles of the Gulf War

An Iraqi T-62 at speed, pictured early during that country's advance into Iran.

In 1979 the Shah of Iran was overthrown, bringing to an end a regime that had been in power for some 37 years and had in recent years built up one of the most powerful and well-trained armed forces in the Middle East. The strength of the Iranian army included three armoured and three infantry divisions, plus four independent brigades which were equipped with some 900 Chieftain tanks, 400 M47 and M48 tanks, 460 M60A1 tanks, over 250 Scorpion reconnaissance vehicles, many APCs (armoured personnel carriers) plus self-propelled guns and self-propelled howitzers, and (most importantly) mobile air-defence systems.

At this time the Iraqi army had a strength of some four armoured, four infantry and two mechanized brigades plus two special-forces brigades, one independent brigade and the Republican Guard Brigade. All major equipment was Russian, including over 2,000 T-54, T-55 and T-62 MBTs.

Border flare-ups

When the Shah was in power there was little trouble between the two countries as in 1975 a treaty was negotiated to redefine the mutual borders. But from May 1979 there were a number of clashes along the Iranian/Iraqi border, and between April and July some 30,000 Iraqis of Iranian origin were expelled from Iraq; in September 1980 President Hussein cancelled the 1975 treaty between the two countries. On 20 September Iraqi aircraft bombed a number of airfields in Iran, and two days later the Iraqi army advanced into Iran. According to Iraq, all she wished was to return to Iraqi sovereignty parts of the Shatt-al-Arab waterway and territory ceded to Iran in 1975.

Iraqi forces advanced on three main axes, towards Qasr-e-Shirin in the north, Mehran in the centre, and (the most important of the three) Susangerd and Khorramshahr in the south. Iraq hoped that such a move would quickly lead to the downfall of the regime of Ayatollah Khomeini. Iraq succeeded in crossing the border, but the depth of penetration varied considerably. Most of the successes were in the southern thrust, with Khorramshahr falling after a bitter struggle. Iran did mount minor counterattacks in the northern and central sections, usually with little armour or artillery support, and did regain some of its lost territory.

In January 1981 the Iranians mounted a much larger counterattack south of Susangerd in the southern sector. This was a complete failure as the tanks were apparently unsupported by infantry, and the terrain, which at that time of year is soft, was unsuitable for tanks. It is believed that Iraq lost about 50 T-62s with Iran losing well over 100 Chieftains and M60A1s.

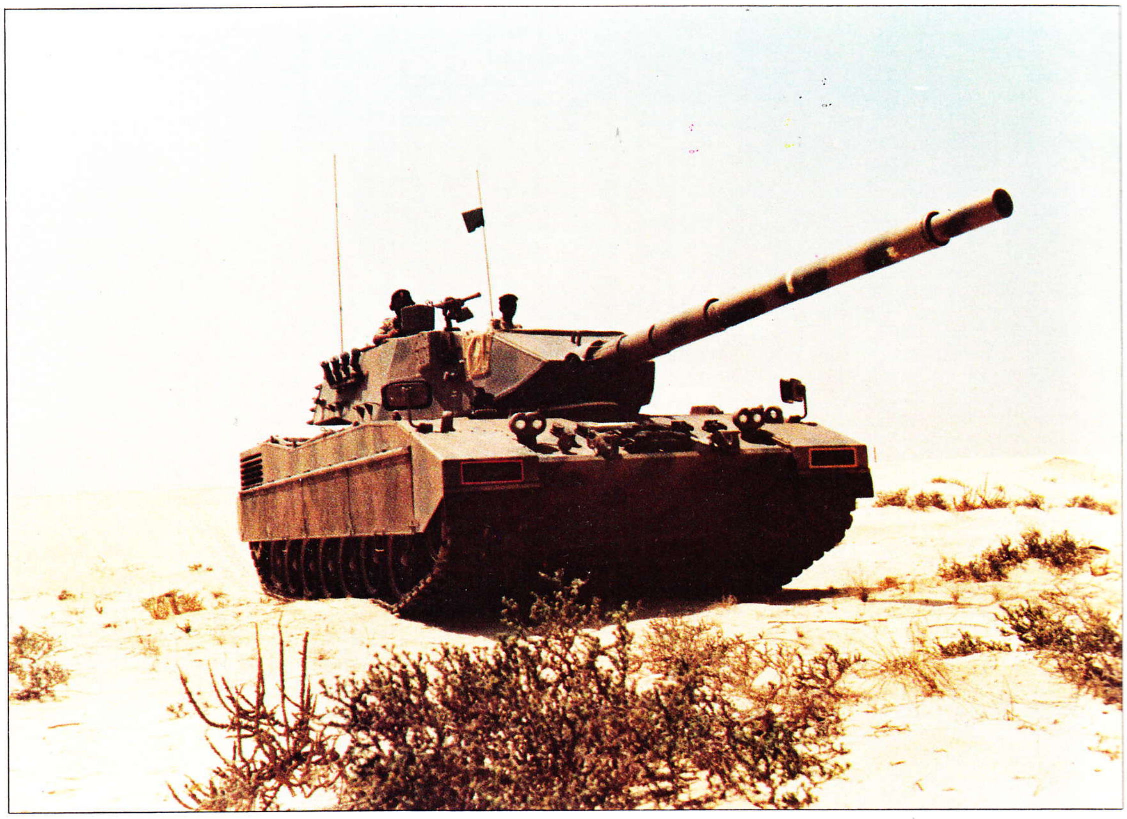
Armour turn-round

In the first year Iraq lost about 250 or 300 tanks, and Iran probably about the same number. Then early in 1982 it was reported that Iraq had captured some 50 operational Chieftains abandoned by their Iranian crews; M60A1s and Scorpions were also captured. When well-crewed, the Iranian Chieftains with their 120-mm rifled guns have been more than a match for the 100-mm gunned T-54s and T-55s, and the 115-mm gunned T-62s of the Iraqi army.

By 1981 both countries were in dire need of additional supplies of equipment, especially new vehicles. Iran succeeded in getting spare tank parts (probably for her M48s and M60s) from Israel, as well as from Syria, Libya and some Soviet bloc countries. Iraq was still receiving supplies (including anti-tank missiles) from France and the USSR as well as from North Korea, North Vietnam and Egypt, the last supplying mainly ammunition, and T-54 and T-55 tanks which were becoming surplus as a result of deliveries of more modern American equipment. Early in 1983 Iraq started to receive considerable amounts of equipment from China including the Type 69 MBT which was supplied via Saudi Arabia.

ITALY

OF-40 Main Battle Tank



OF-40 MBT of the Dubai army (part of the United Arab Emirates), which has ordered 18 vehicles with an option on a further 28. This MBT uses automotive components of the West German Leopard 1 and is armed with a 105-mm gun and two 7.62-mm (0.3-in) MGs. The fire-control system includes a laser rangefinder and a ballistic computer.

The standard tank of the Italian army during the 1950s was the American-supplied M47. The country did take part in the formulation of the requirement which eventually led to the production of the French AMX-30 and West German Leopard 1 MBTs. Italy decided to make the American M60A1 under licence instead, and 200 of these were made by OTO Melara; another 100 were supplied direct from the USA. In 1970 Italy placed an order with West Germany for 200 Leopard 1s, and at the same time OTO Melara obtained a licence to undertake production of the vehicle in Italy. By 1982 some 720 had been completed for the Italian army and a further 160 of three specialized versions (ARV, AVLB and AEV) were due to be completed by the mid-1980s.

Under the terms of the Leopard 1 licence OTO Melara could not export the tank, so the company designed a new tank specifically for the export market under the designation **OF-40**, the O in the designation standing for the prime contractor (OTO Melara) and the F for Fiat which supplies the complete powerpack (engine, transmission and cooling system); 40 stands the empty weight of the vehicle, 40 tonnes.

The first prototype was completed in 1980, and the first production contract was placed by the small country of Dubai in the Persian Gulf, which received its first production vehicles in 1981.

The hull and turret of the OF-40 are of all welded steel construction and are divided into three compartments, with the driver's at the front, fighting in the centre, and engine and transmission at the rear.

The main armament comprises an OTO Melara-designed 105-mm rifled gun which is fitted with a falling-wedge breech-block, concentric buffer and spring recuperator. When the gun recoils the breech-block automatically opens and ejects the empty cartridge cases into a bag under the breech of the weapon. Towards the rear of the turret on the left is a circular hatch which can be used to dispose of the empty shell cases or to resupply the vehicle with ammunition. A total of 61 rounds of ammunition is carried, 42 to the left of the driver and the remainder in the turret for ready use.

A 7.62-mm (0.3-in) machine-gun is mounted co-axially with the main armament, and a similar weapon is mounted on the turret roof for anti-aircraft defence. Four smoke/fragmentation grenade launchers are mounted on each side of the turret, firing forwards. The OF-40 has a Officine Galileo OG14LR fire-control system which includes a computer and a Selenia laser rangefinder. As an option, a fully stabilized fire-control system can be fitted, enabling the OF-40 to engage enemy tanks when moving at speed across country. The commander has a roof-mounted French SFIM stabilized sight, which is used for both surveillance and target acquisition. Standard equipment on the OF-40 MBT includes night-vision equipment and an NBC pack which is mounted to the left of the driver.

The chassis of the OF-40 is also used as the basis for a 76-mm self-propelled anti-aircraft tank currently being developed by OTO Melara.

Specification

Crew: 4

Weight: 43 tonnes

Engine: 10-cylinder diesel developing 830 hp (619 kW)

Dimensions: length (with gun forward) 9.22 m (30 ft 3 in); length (hull) 6.89 m (22 ft 7¼ in); width 3.51 m (11 ft 6¼ in); height (turret top) 2.45 m (8 ft 0⅓ in)

Performance: maximum road speed 60 km/h (37.3 mph); maximum range (road) 600 km (373 miles); fording 1.2 m (3 ft 11¼ in); gradient 60%; vertical obstacle 1.15 m (3 ft 9¼ in); trench 3 m (9 ft 10 in)

WEST GERMANY

Leopard 1 Main Battle Tank

When the West German army was reformed it was initially equipped with American M47 and M48 tanks, both of which were armed with a 90-mm gun. A decision was soon taken that the former would be replaced by a more modern tank armed with a 105-mm gun, and two design teams (called A and B) were selected to build prototypes of vehicles for comparative trials. At the same time France built prototypes of the AMX-30 to replace its American-supplied M47s. It had been expected that either the West German MBTs or the French AMX-30 would become the common MBT of both armies, but in the end each country went its own way. In the case of West Germany, further development of the team A design resulted in the standardization of the vehicle as the **Leopard 1**. The first production tanks were completed by Krauss-Maffei of Munich in September 1965 and production continued until 1979. A total of 2,437 MBTs was built for the West German army in four basic models designated **Leopard 1A1** (with additional armour this became the **Leopard 1A1A1**), the **Leopard 1A2**, the **Leopard 1A3** (with a new welded turret) and the **Leopard 1A4** (with a new welded turret and new fire-control system). The Leopard 1 was also adopted by Australia (90 vehicles), Belgium (334), Canada (114), Denmark (120), Italy (920, of which 720 were built in Italy by OTO Melara), the Netherlands (468) and Norway (78). Production was resumed by Krauss Maffei and Krupp MaK in 1982 to meet further orders from Greece (106) and Turkey (77).

The Leopard 1 is armed with the proven British Royal Ordnance Factories Nottingham L7 series rifled tank gun, and can fire a variety of ammunition including APDS, APFSDS, HEAT, HESH and Smoke, a total of 60 rounds being carried. A 7.62-mm (0.3-in) machine-gun is mounted co-axially with the main armament, a similar weapon is mounted on the turret roof for use in the anti-aircraft role, and four three-barrelled smoke dischargers are mounted on each side of the turret, firing forwards. A gun stabilization system is fitted, enabling the main armament to be laid and fired whilst the tank is moving across country. Leopard 1s have an NBC system and a full set of night-vision equipment for the commander, gunner and loader. When originally introduced, the latter was of the first-generation infra-red type but this is now being replaced by the second-generation passive type.

A wide range of optional equipment has also been developed for the Leopard 1 including a schnorkel which enables the tank to ford deep rivers and streams to a maximum depth of 4 m (13 ft 1½ in). An hydraulic blade can be mounted at the front of the hull and this is operated by the driver to clear or prepare battlefield obstacles. Most West German and Dutch Leopards are having appliqué armour fitted to their turrets to give increased armour protection against missiles and HEAT projectiles.

The basic Leopard 1 chassis has been the basis for a complete family of vehicles which have been designed to support the MBT on the battlefield. All of the specialized versions, with the exception of the Gepard, have been designed and built by MaK of Kiel who have also built a few of the Leopard 1 MBTs.

Specification

Crew: 4

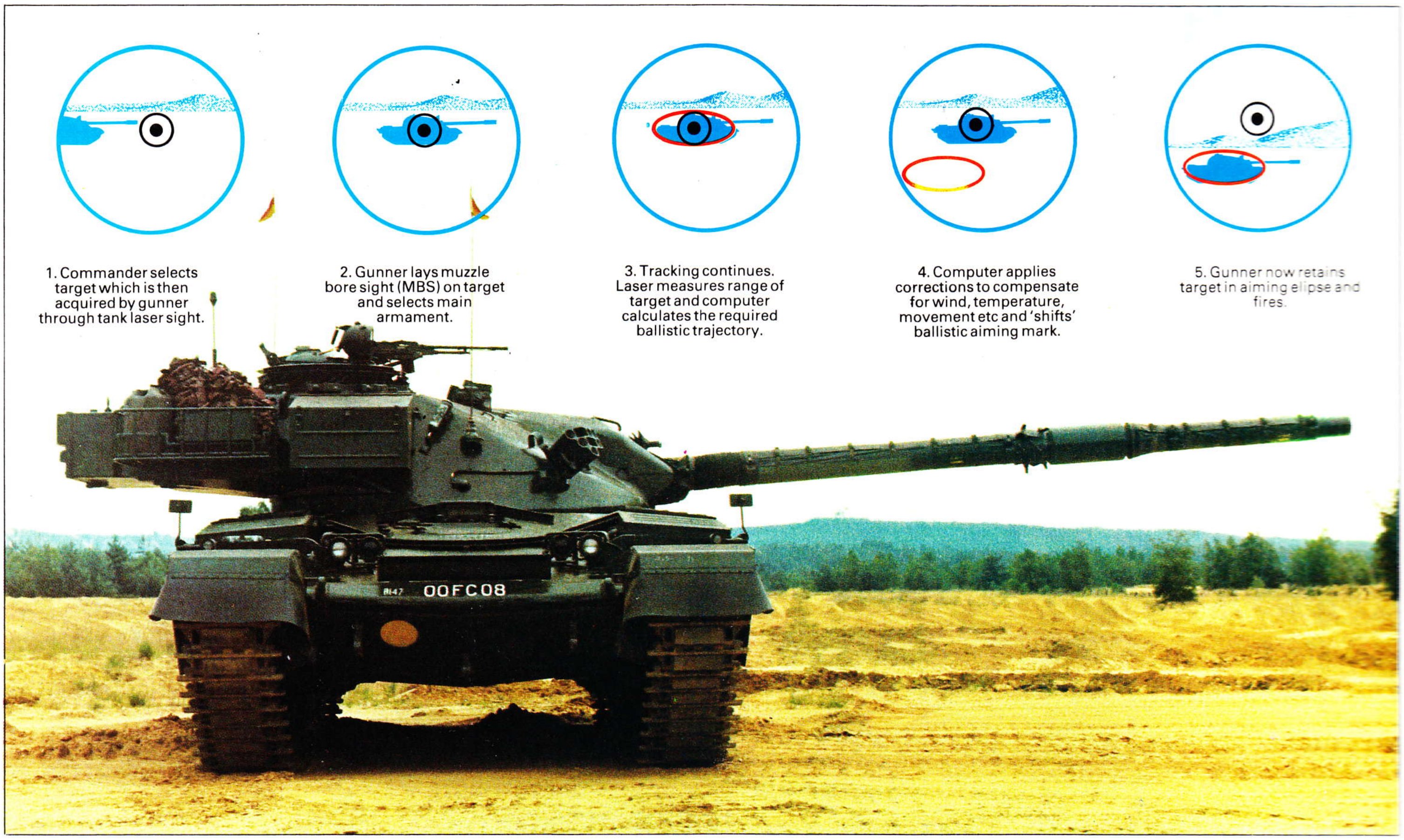
Weight: 40 tonnes

Engine: MTU 10-cylinder diesel developing 830 hp (619 kW)

Dimensions: length (with gun forward) 9.543 m (31 ft 4 in); length (hull) 7.09 m (23 ft 3 in); width 3.25 m (10 ft 8 in); height (overall) 2.613 m (8 ft 7 in)

Performance: maximum road speed 65 km/h (40.4 mph); maximum range 600 km (373 miles); fording 60%; vertical obstacle 1.15 m (3 ft 9¼ in); trench 3 m (9 ft 10 in)

Tank Fire-Control Systems



1. Commander selects target which is then acquired by gunner through tank laser sight.

2. Gunner lays muzzle bore sight (MBS) on target and selects main armament.

3. Tracking continues. Laser measures range of target and computer calculates the required ballistic trajectory.

4. Computer applies corrections to compensate for wind, temperature, movement etc and 'shifts' ballistic aiming mark.

5. Gunner now retains target in aiming elipse and fires.

For many years tank guns were aimed with the aid of a telescope linked to the main armament, the gunner using manual controls to line up the sight (and hence the gun) with the target. This required constant practice and meant that several rounds had to be fired in order to hit the target, even at the relatively short distances involved, usually under 1000 m (1,095 yards). The optical sight did not take into account such vital factors as speed of the wind, the velocity of the ammunition and the ambient temperature, all of which have some effect on the accuracy of the weapon. Initially, optical rangefinders of the stadiametric or coincidence type were used to find the exact range of the target and this information was transferred to a mechanical computer for calculation of the weapon elevation required to hit the target. These rangefinders were difficult to operate and required a considerable amount of training, and armies in the Middle and Far East found these especially difficult to operate.

In the 1950s the UK developed the ranging machine-gun (RMG) concept, in which a 0.5-in (12.7-mm) machine-gun was mounted co-axially with the 105-mm L7 gun in the Centurion.

A similar weapon was fitted to the Chieftain MBT with its 120-mm gun, but as the RMG was only effective out of some 1830 m (2,000 yards) the full potential of the gun, which is effective out to well over 2060 m (2,250 yards), could not be exploited. The RMG was later replaced by a Barr and Stroud Tank Laser Sight (TLS) which incorporates a laser rangefinder which is accurate to 5 m (16 ft) at all battlefield ranges.

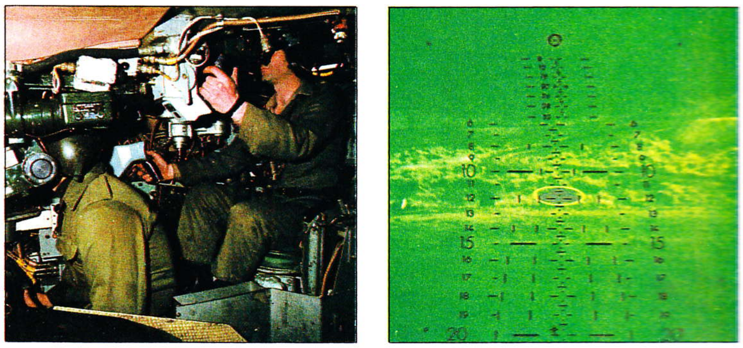
There are many types of fire-control system available for MBTs today, but space permits brief descriptions of only two of these, the British Marconi Space and Defence Systems Improved Fire Control System (IFCS) and the Belgian SABCA fire-control system.

All British army Chieftains are now rapidly being retrofitted with the IFCS which, coupled with the already installed TLS, enables the tank to engage and hit stationary targets at a range of 3000 m (3,280 yards) and moving targets at a range of 2000 m (2,185 yards) with a high probability of a first-round hit.

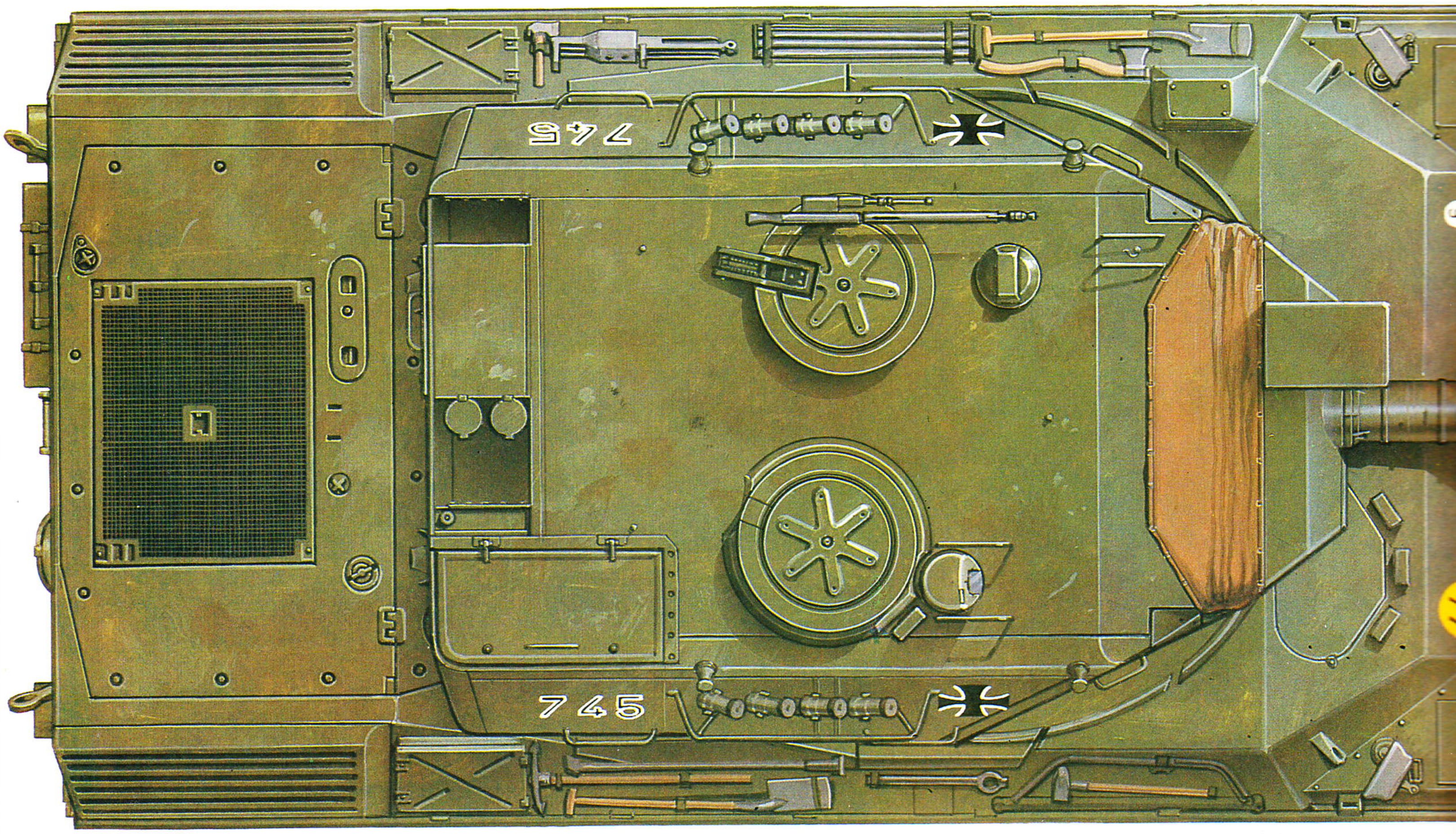
The IFCS has a Marconi 12-12P digital computer which automatically gathers and updates information from a number of sensors for factors such as wind direction, angle of sight, charge temperature, barrel wear, target displacement and ammunition type. It then calculates the ballistic solution and correct laying offsets for each target engagement and controls the automatic laying of the gun in azimuth (line) and elevation (including the tracking of moving targets) in readiness to fire. In the Chieftain both the commander and gunner can lay and fire the 120-mm gun, the commander having override control. The IFCS has been fitted to a number of other vehicles for trials purposes and has also been installed in the Khalid MBT being built for Jordan and the new Challenger MBT for the British army. During one trial of a Chieftain fitted with the IFCS the crew obtained nine first round hits within 53 seconds at ranges of between 1600 and 2900 m (1,750 and 3,170 yards) in a 110° arc.

The Belgian SABCA fire-control system has already been fitted to the Leopard 1s of the Australian, Belgian and Canadian armies. It consists of a laser rangefinder, seven sensors, an analogue computer and an optical sight. The sensors measure ambient and ammunition temperature, air pressure, gun barrel wear, cross wind, trunnion cant or tilt, and rate of turret traverse. The computer determines the angles between the line of side and the axis of the gun, and the output is transformed into a displacement of cross hairs in the gunner's sight. When the cross hairs are brought back onto the target, the gun is laid on the correct target elevation and azimuth.

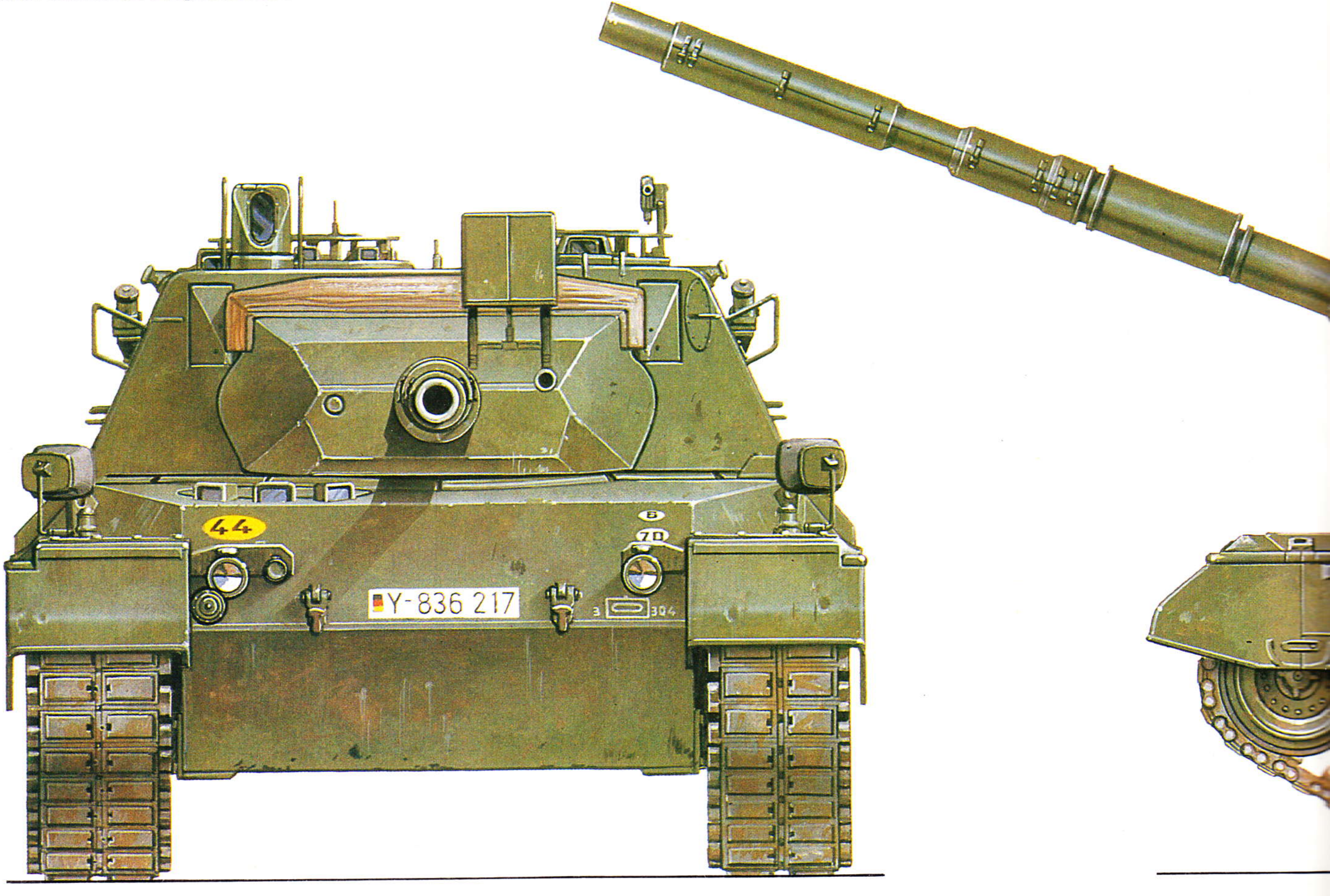
The widespread introduction of these fire-control systems, taken together with the installation of a gun-stabilization system, has enabled most tanks to hit the target with the first shot under most operational conditions. But this can only be achieved if the tank crew carries out constant and effective training and is backed up by good workshop facilities in order that any faults in the system can be quickly traced and rectified. For this reason many companies are now offering tank gunnery training systems to enable tank crews to practice tank-on-tank engagements without using live ammunition.



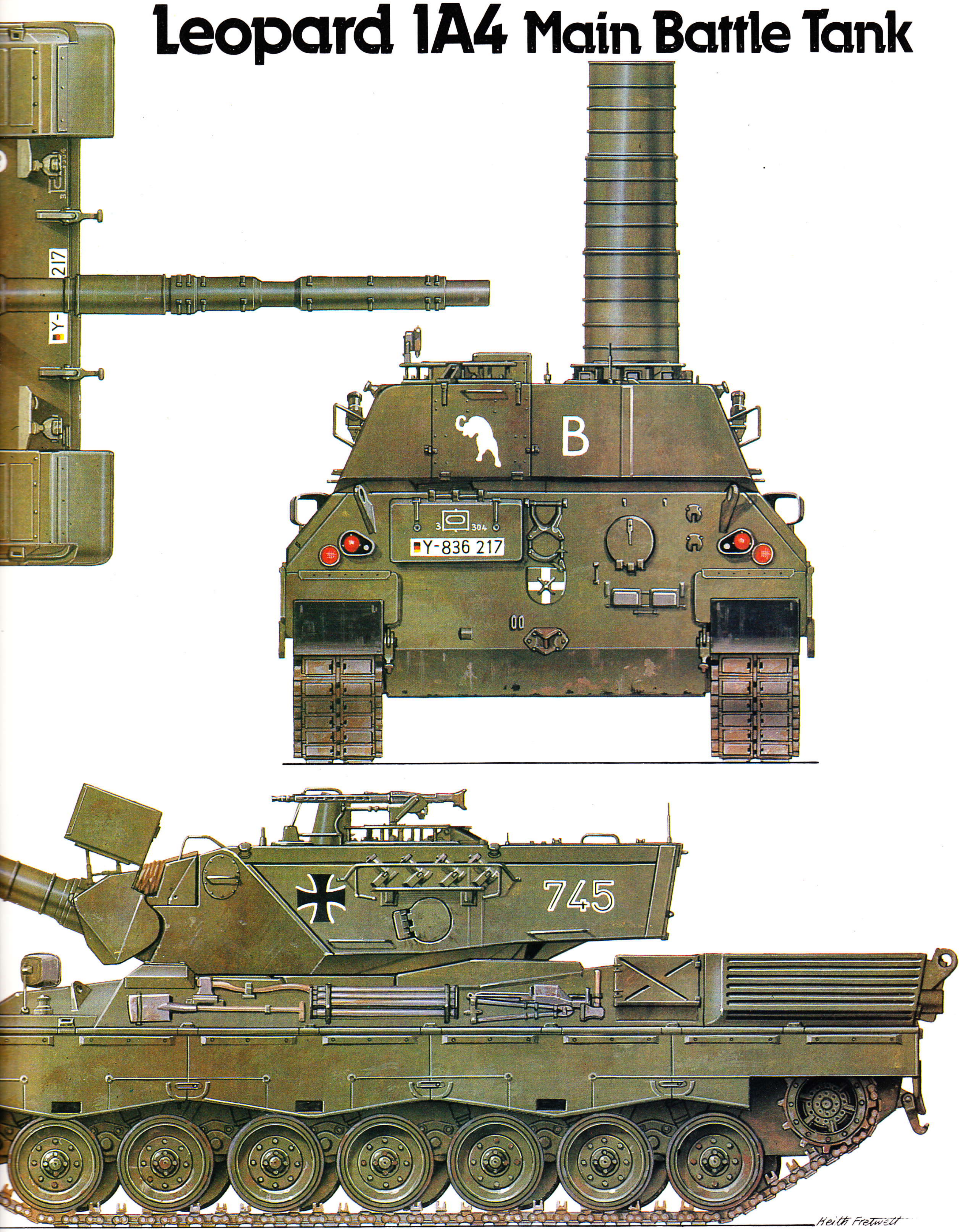
Battle tanks can be extremely obvious, and therefore vulnerable, targets. To counter this disadvantage commanders rely on reducing engagement times to a minimum and increasing accuracy of fire to a maximum. The British Marconi Improved Fire Control System is one of a number of computer-assisted systems which offer a rapid and a accurate aiming facility. Within 10 seconds of sighting a target (above right) the gunner or commander (above left) can lay his gun to the correct azimuth and elevation (offsetting for wind, temperature, movement etc), select a choice of rounds, and fire. A Chieftain crew has been seen to obtain three hits on each of three small targets at ranges of 1,750 to 3,175 yards (1600 to 2900 m), within a wide arc, with two types of ammunition within 53 seconds.



Four-view illustration of the Leopard 1A4, the final production model for the West German army with a new all-welded turret with improved armour protection and a stabilized sight for the commander. The rear view shows the tank fitted with a schnorkel for deep fording operations, with which the Leopard 1 can ford to a depth of 2.25 m (7 ft 4½ in).



Leopard 1A4 Main Battle Tank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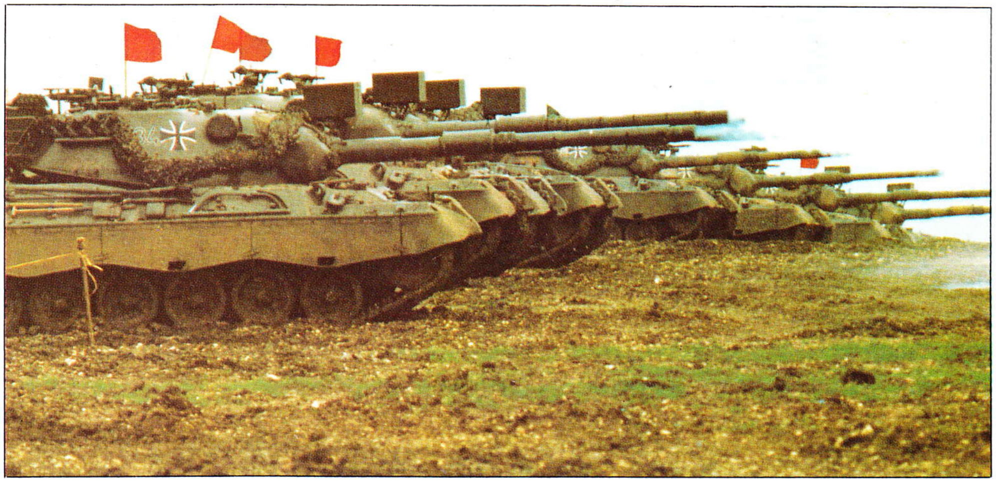
Leopard in Action



Leopard 1 MBTs on the firing ranges. This tank has been modernized to serve into the 1990s, when it will be replaced by a new MBT currently at the concept stage.

As the first main battle tank to go into production in West Germany since 1945, when that country was a world leader in AFV design, the Leopard 1 could hardly fail to be a well-planned and serviceable tank. It could hardly be more conventional, but tanks are not all the same and Leopard 1 is a good compromise. Clearly better than US and French counterparts in being more squat, it has a modest weight of some 40 to 42.5 tonnes (depending on variant), which reflects the belief in the early 1960s that there was little point in using really thick armour. The Leopard was designed instead to survive by being agile, and it is generally accepted that this tank has the best cross-country performance of any MBT of its era.

Climbing aboard is simple, and even in the early versions with a small turret there is plenty of room in the interior. The driver sits in the front of the welded hull on the right side. This leaves room beside him on the left for 41 of the total of 60 rounds for the L7A3 gun, where they are readily accessible in front of the loader on the left of the gun. The gunner sits on the other side of the gun, with the commander behind him. The loader and commander both have circular hatches in the cast oval turret roof, one of the hatches (usually the loader's) having the MG3 machine-gun for local firing and AA use.

The MTU diesel, a 10-cylinder Vee rated at 830 hp (619 kW), is well isolated at the rear and water-cooled, which helps to make the Leopard one of the quietest tanks to drive. Changing gear is very effortless because of the hydraulic torque-converter, and as soon as the tank is properly on the move across rough terrain it is obvious that the ride is like a Rolls-Royce compared with that of some other AFVs. The 14 road wheels have large vertical travel and are sprung by torsion bars combined with five hydraulic shock-absorbers in a system cunningly designed to keep the hull sensibly level even in traversing the roughest terrain. Even the driver with his head outside hears little but a muted and distant engine note, and when travelling in the sealed condition the crew members are amazingly comfortable and insulated from the few noises.

Fighting comforts

The entire fighting compartment is air-conditioned to avoid extremes of temperature in a way that was never attempted in World War II. In cold weather the interior can be brought up to comfortable temperature in about two minutes by a heater burning main-engine fuel oil. Exhaust heat from this installation pre-heats the engine coolant while the hot crew-compartment air can be specially blown over the eight electric-system batteries to warm them before engine start. There are several features designed to avoid toxic propellant fumes from entering the crew compartment, and even the bag for the spent cartridge cases is continuously scavenged by an air extractor system. As in most modern tanks there is room for food and drink, and an electric oven and hot cup are provided for the quick preparation of snacks in the field.

Probably the most vital of a tank's functioning sytems is the main fire-control unit. That of the Leopard 1 naturally stemmed in basic principles from that of the old American M47 tank which the Leopard replaced in the German army. There are no fewer than 14 periscopes (eight for the commander, three for the driver, two for the loader and one for the gunner), but the main sight is a large periscope for the commander incorporating a telescope whose magnification can be varied from ×6 to ×20. Its head rotates relative to the turret, and the commander uses it to maintain a detailed lookout over all distant terrain, to find targets and to determine stadia ranging (finding the range of targets of known size simply from their apparent size in the optics).

Rangefinding

As soon as the commander finds a target he holds the optics of the sight head on it while he traverses the turret to bring the gun onto the same bearing. A flexible drive-link between the turret azimuth and the sight head keeps the latter on target no matter how the turret is traversed. The tangent elevation of the gun is also electrically fed to the commander's sight so that in emergency he can lay and fire the 105-mm gun. Normally the gun is laid by the gunner using his ×16 binocular rangefinder, which has a base length of 1.7 m (5 ft 7 in). For rapid or unskilled ranging an optical coincidence system is used, similar to that in many cameras, but for maximum accuracy in poor visibility a stereoscopic method is preferred. The main gun has a very flat trajectory, but tangent elevation appropriate to the ammunition selected – APDS (armour-piercing discarding sabot), HEAT (high-explosive anti-tank) and HESH (high-explosive squash head) – is automatically fed in as the exact range is determined.

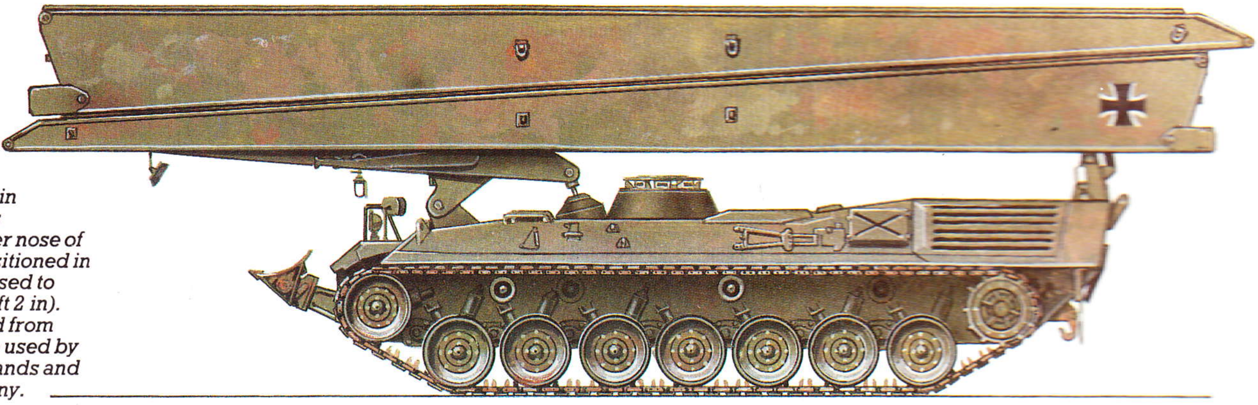
A third ranging/sighting system is a monocular telescope co-axial with the gun, used by the gunner only. At night the panoramic sight of the commander can be replaced by an IR (infra-red) device which is extremely sensitive to IR wavelengths. Unaided it can spot the exhaust of a tank or a hot gun barrel at a distance of 2000 to 3000 m (2,185 to 3,280 yards), these and comparable objects showing white against the black night. At intervals the commander can switch on his special searchlight to emit a stream of IR 'black light' to give a clear picture on his IR sighting device, though this has an obvious disadvantage in that it looks like a lighthouse to any opposing tank commander with his eye on an IR receiver sight. When needed the same searchlight can emit white (visible) light. The Leopard is itself painted with greyish camouflage which is specially formulated to minimize the tank's reflectivity to IR, while its engine exhaust is mixed with cold air before being discharged overboard.

As soon as the main armament is on target, loaded and at the correct elevation the gunner or commander can fire it. Automatically, shutters blank off all sight systems for 0.25 second to avoid flash blindness at night. The breech automatically opens after the shot, the spent case is dumped in the fume-extracted bag, and in action a preselected type of fresh round is loaded at once, the breech closing automatically. Though far from new in design, the British gun is unfailingly accurate, typical figures with APDS ammunition at a range of 1000 m (1,095 yards) being 99 direct hits out of 100 rounds fired against a target slightly smaller than a typical tank turret. At the same distance the score against a tank is 100, or 98 at 2000 m (2,185 yards) and 89 at 3000 m (3,280 yards). When the Leopard 1 fired on the move, the scores were lower, but early in production the Leopard 1A1 replaced the first model and one of its new features was an improved autostabilization system which gives a 50 per cent first-strike probability even when firing on the move across country. The autostabilization greatly speeds the task of laying the gun when the vehicle is stationary, and enables the target and the shot fall to be accurately observed after the vehicle has started moving again. Another add-on was a thermal sleeve around the barrel to minimize distortion caused by the barrel ever being hot on one side and cooler on the other.

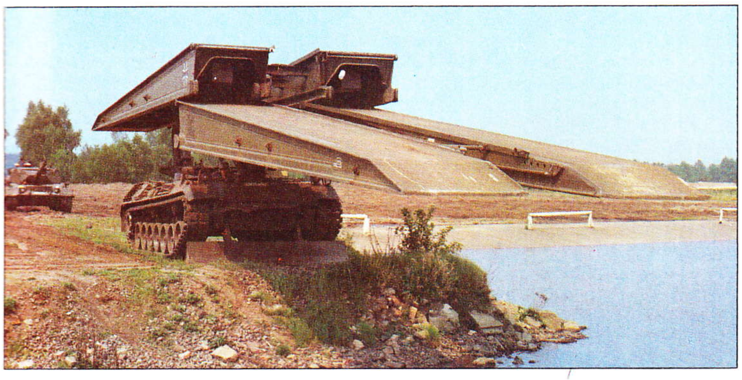
Night vision and fire control

With the Leopard 1A2 variant a major change was replacement of the IR system by light-amplification periscopes. Electronic image intensifier systems emit no radiation to give away the tank's own position, and in effect merely improve the crew's vision so much that they can see in the dark. In the Leopard 1A3 the turret is a new all-welded pattern with spaced armour (such armour retrofitted to Leopard 1A1 tanks turns them into Leopard 1A1A1s), which greatly improves resistance to hollow-charge projectiles, though nobody would pretend even this turret could withstand a direct hit by a modern anti-armour missile. The Leopard 1A3 turret is much roomier, making for increased comfort in action (though by Russian standards even the original turret was amazingly capacious!). Last of the Leopard 1s to be built were 250 vehicles designated Leopard 1A4 with a completely new computerized fire-control called COBELDA, as well as a daylight IR panoramic telescope for the commander.

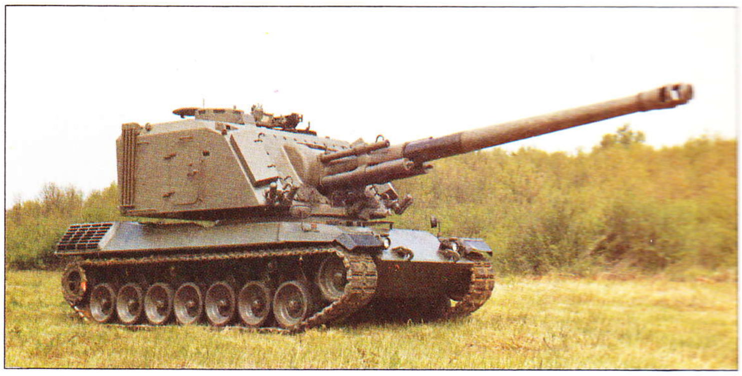
The Leopard Family



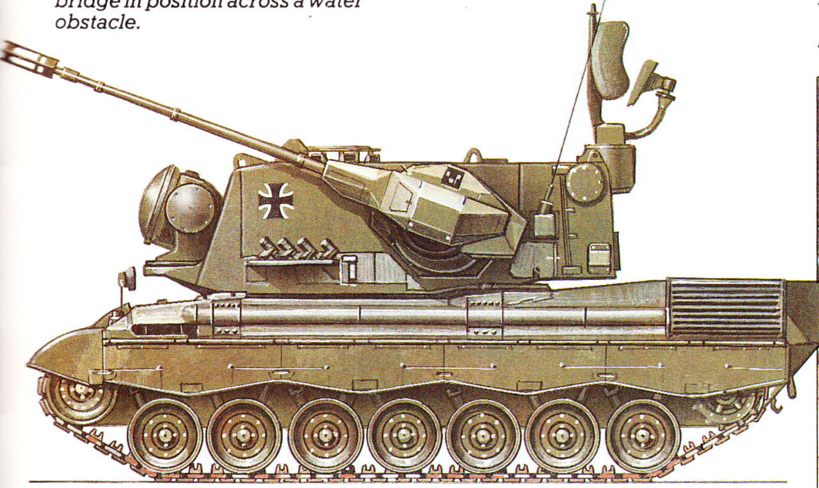
Leopard Biber bridgelayer in travelling order showing its stabilizer/dozer blade under nose of tank. The bridge can be positioned in less than five minutes and used to span gaps of up to 22 m (72 ft 2 in). The bridge can be retrieved from either end. The Biber is also used by Australia, Canada, Netherlands and Italy as well as West Germany.



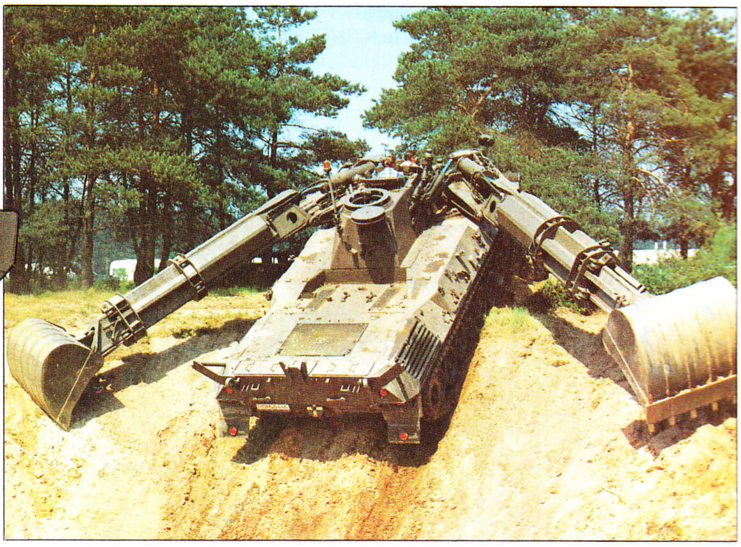
Leopard Biber bridgelayer laying its bridge in position across a water obstacle.



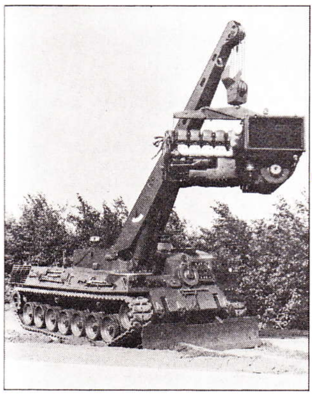
Leopard 1 MBT chassis with turret removed and replaced by the same turret as on the French 155-mm GCT self-propelled gun now in service with France, Saudi Arabia and Iraq. The weapon can fire eight rounds per minute due to its automatic loading.



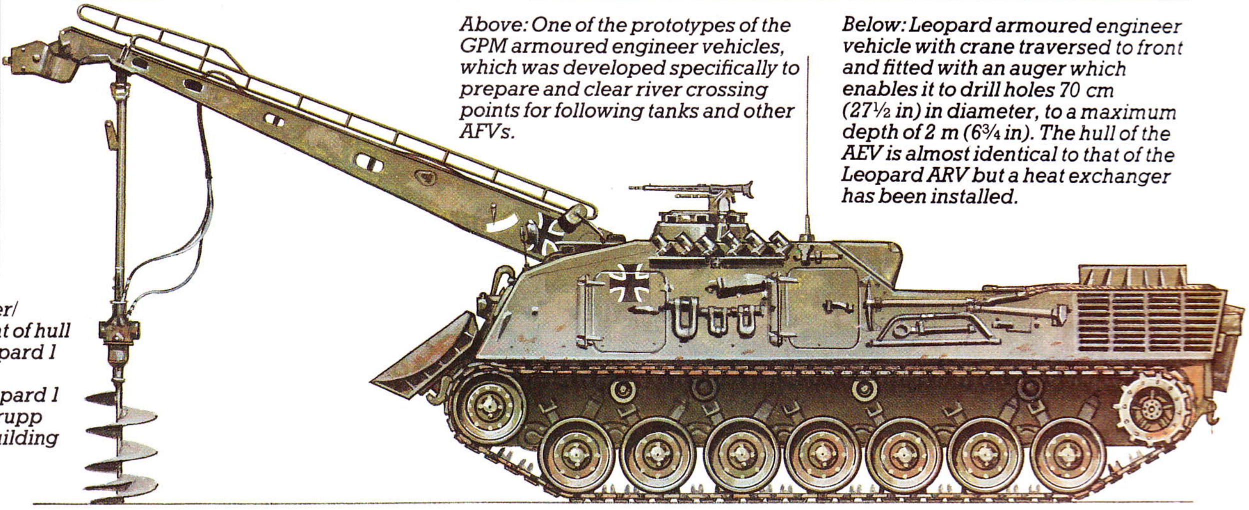
Above: Gepard twin 35-mm self-propelled anti-aircraft gun system with tracking (turret front) and surveillance (turret rear) radars in operating positions.



Above: One of the prototypes of the GPM armoured engineer vehicles, which was developed specifically to prepare and clear river crossing points for following tanks and other AFVs.



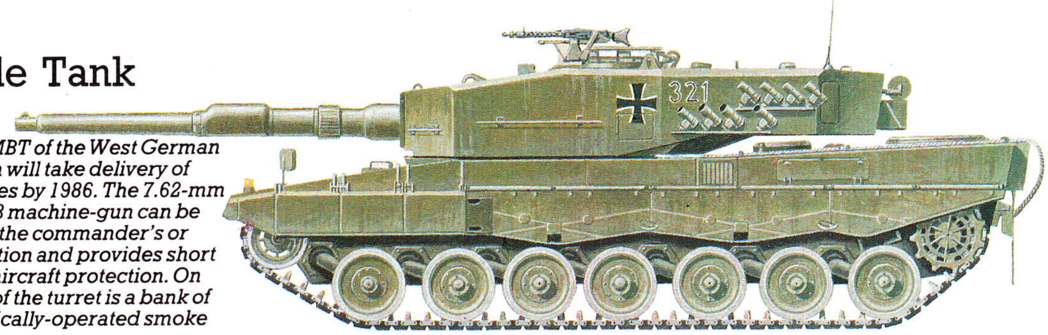
Above: Leopard 1 ARV with dozer/stabilizing blade lowered at front of hull and crane lifting a complete Leopard 1 powerpack. All ARVs, AEVs and bridgelayer members of the Leopard 1 tank family have been built by Krupp MaK of Kiel, who are now also building the Leopard 2 MBT.



Below: Leopard armoured engineer vehicle with crane traversed to front and fitted with an auger which enables it to drill holes 70 cm (27½ in) in diameter, to a maximum depth of 2 m (6¾ in). The hull of the AEV is almost identical to that of the Leopard ARV but a heat exchanger has been installed.

WEST GERMANY

Leopard 2 Main Battle Tank



Leopard 2 MBT of the West German army, which will take delivery of 1,800 vehicles by 1986. The 7.62-mm (0.3-in) MG3 machine-gun can be mounted at the commander's or loader's station and provides short range anti-aircraft protection. On either side of the turret is a bank of eight electrically-operated smoke dischargers.

In the late 1960s West Germany and the USA were jointly developing a new MBT designated MBT-70. In 1970 this was cancelled as a result of rising costs, and West Germany went ahead to develop a new MBT eventually known as the **Leopard 2**. This is fact incorporated the engine, transmission and certain other components of the MBT-70. A total of 16 hulls and 17 turrets was built to test various suspension, armaments (105-mm or 120-mm smooth-bore guns) and fire-control combinations. A special version was also built at a later date to meet the requirements of the US Army; this was called the **Leopard 2(AV)** and was armed with the standard 105-mm L7 rifled gun.

After troop trials had been carried out in both West Germany and abroad, the Leopard 2 was accepted for service by the West German army, and in 1977 an order was placed for a total of 1,800 Leopard 2 MBTs, of which Krupp MaK is to build 810 and Krauss-Maffei of Munich the remaining 990. The first production tanks were handed over to the West German army in 1979, and it is expected that final deliveries will be made in 1986. In 1979 the Netherlands selected the Leopard 2 to replace its ageing Centurion MBTs and AMX-13 light tanks armed with a 105-mm gun; a total of 445 Leopard 2 is to be delivered by 1986, the first of these having being handed over in 1982. Under the terms of this contract, which is worth some Fl2,400 million, many of the components will be supplied by Dutch industry. At the time of writing the Leopard 2 and the American M1 Abrams were under intensive evaluation by the Swiss army, which needs to replace its old Centurions and Pz 61s from the late 1980s with a more modern vehicle.

The Leopard 2 is armed with a Rheinmetall-developed 120-mm smooth-bore gun which fires two main types of ammunition, namely HEAT-MP-T (High Explosive Anti-Tank Multi-Purpose Tracer) and APFSDS-T (Armour-Piercing Fin-Stabilized Discarding-Sabot Tracer); in each case there is also a practice round. The former is used against all battlefield targets, including field fortifications and lighter vehicles, while the latter is the main tank-killing round and is said to be able to penetrate the frontal armour of all current tanks including the Soviet T-64 and T-72. The ammunition, also developed by Rheinmetall, is unusual in that it has a combustible cartridge case, so that after the gun is fired all that remains of the cartridge is the base stub which is ejected into a bag under the breech of the gun. A total of 42 rounds of 120-mm ammunition is carried, compared with 60 rounds for the first-generation Leopard 1 with its 105-mm gun. This is not a great drawback as the 120-mm round has greater penetration and the fire-control system gives a much greater hit probability. A 7.62-mm (0.3-in) machine-gun is mounted co-axially with the main armament, and a similar weapon is mounted on the turret roof for anti-aircraft defence. On each side of the turret are eight smoke dischargers, firing forwards.

The commander of the Leopard 2, who sits on the right of the turret, is provided with a stabilized roof-mounted sight which has a variable magnification of ×2 and ×8; this can be traversed through 360° for observation and can also be used to lay and fire the main armament. The gunner, who is seated forward and below the commander, also has a stabilized sight, but his incorporates a laser rangefinder and a thermal image unit, both of which are linked to the fire-control system. The main armament is fully stabilized and standard equipment includes passive night-vision equipment, an NBC system, a fire extinguishing system and a schnorkel for deep wading.

The hull and turret of the Leopard 2 incorporate advanced armour which gives it a high degree of battlefield survivability, especially against anti-tank weapons with HEAT warheads. The Leopard 2 is powered by a multi-fuel engine developing 1,500 hp (1119 kW), which gives the Leopard 2 a power-to-weight ratio of 27 hp (20 kW) per tonne compared with just under 20 hp (15 kW) per tonne for the final production models of the Leopard 1. This gives the tank greater acceleration and improved cross-country mobility, which promote survivability on the battlefield.

Specification

Crew: 4

Weight: 55.15 tonnes

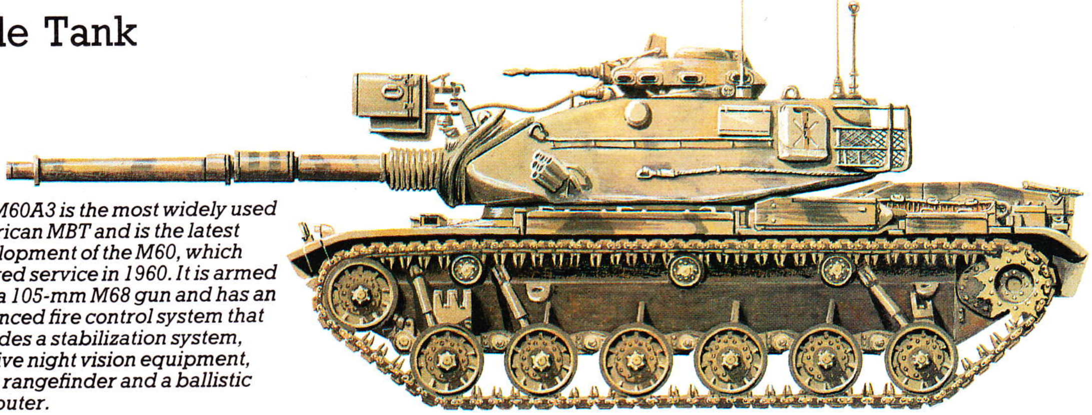
Engine: MTU 12-cylinder multi-fuel developing 1,500 hp (1119 kW)

Dimensions: length (with gun forward) 9.668 m (31 ft 8⅔ in); length (hull) 7.772 m (25 ft 6 in); width 3.7 m (12 ft 1⅔ in); height (overall) 2.79 m (9 ft 1¾ in)

Performance: maximum road speed 72 km/h (45 mph); maximum range 550 km (342 miles); gradient 60%; vertical obstacle 1.1 m (3 ft 7¼ in); trench 3 m (9 ft 10 in)

USA

M60A1 Main Battle Tank



The M60A3 is the most widely used American MBT and is the latest development of the M60, which entered service in 1960. It is armed with a 105-mm M68 gun and has an advanced fire control system that includes a stabilization system, passive night vision equipment, laser rangefinder and a ballistic computer.

In 1956 a decision was taken to develop an improved version of the M48 tank to incorporate a new engine and a larger-calibre main armament. The former was the Teledyne Continental AVDS-1790-P while the latter was the British 105-mm L7A1 barrel fitted with an American-designed breech. The L7A1 was subsequently made under licence in the United States under the designation M68 and fitted to all production examples of this **M60** series (with the exception of the M60A2) and is also fitted to the new M1 MBT which is also produced by General Dynamics.

The M60 entered service with the US Army in 1960 but was soon succeeded in production by the **M60A1** which had a number of modifications including a redesigned turret which offered greater ballistic protection. The **M60A2** was fitted with a new turret armed with a 152-mm weapon system which could fire the Shillelagh missile or a range of conventional ammunition with a combustible cartridge case. A total of 526 M60A2s was built, but the type has now been phased out of service, the chassis being stored for conversion to specialized vehicles.

The current production model is the **M60A3**, which is produced at the Detroit Tank Plant now operated by the Land Systems Division of General Dynamics who took over Chrysler Defense Inc. during 1982. The M60A3 has many improvements over the earlier M60A1, including a Hughes Aircraft Laser Tank Fire Control System, Tank Thermal Sights, main armament stabilized in both elevation and traverse, AVDS-1790-2A RISE (Reliability Improved Selected Equipment) engine, new tracks with replaceable pads, new searchlight over the main armament, thermal sleeve for main armament, new co-axial 7.62-mm (0.3-in) machine-gun and British six-barrelled smoke dischargers mounted on each side of the turret, to name but a few. Many of these improvements have now been retrofitted into the M60A1, which is then redesignated the M60A3.

The M60A3 carries a total of 63 rounds of ammunition for the 105-mm gun, of which 26 are carried in the forward part of the hull, 13 in the turret for ready use, 21 in the turret bustle and three under the gun. A 7.62-mm (0.3-in) machine-gun is mounted co-axially with the main armament, and a 0.5-in (12.7-mm) machine-gun is mounted in the commander's cupola.

Production of the M60A3 is now expected to be completed in 1984, by which time well over 13,000 vehicles should have been built for the home and export markets. In addition to being used by the US Army and US Marines, the M60 series is also used by Austria, Egypt, Iran, Israel, Italy (including 200 built under licence by OTO-Melara), Jordan, Morocco, Saudi Arabia, Sudan, Tunisia and the Yemen Arab Republic (North Yemen).

There are only two main versions of the M60, namely the **M60 AVLB** and the **M728 CEV**. The M60 AVLB has a scissors bridge on top of the hull, and this is launched over the front of the vehicle to span gaps of up to 60 ft 0 in (18.288 m). The M728 Combat Engineer Vehicle has a hull and turret similar to those of the M60A1, but is armed with a 165-mm demolition gun which fires a HESH (High Explosive Squash Head) round to demolish battlefield fortifications and pillboxes. Mounted at the front of the vehicle is an hydraulic dozer blade to clear battlefield obstacles and prepare fire positions for other AFVs, and pivoted at the front of the hull is an A-frame which lies back over the rear when not required.

Specification

Crew: 4

Weight: 48.98 tonnes

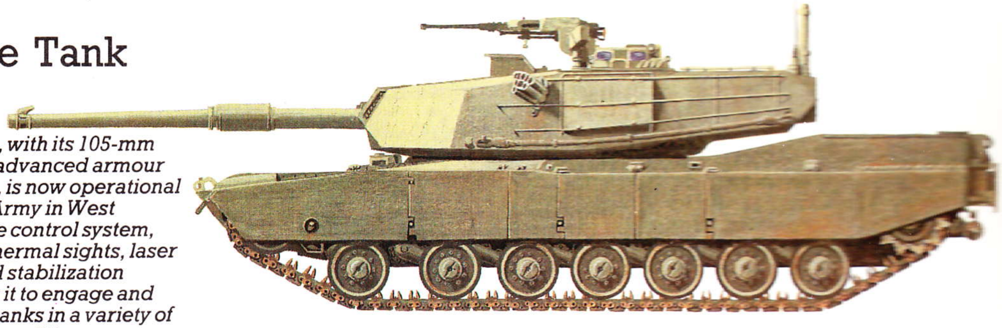
Engine: Continental AVDS-1790-2A 12-cylinder diesel developing 750 bhp (560 kW)

Dimensions: length (with gun forward) 9.436 m (30 ft 11½ in); length (hull) 6.946 m (22 ft 9½ in); width 3.631 m (11 ft 11 in); height 3.27 m (10 ft 8¼ in)

Performance: maximum road speed 48.28 km/h (30 mph); maximum road range 500 km (310 miles); fording 1.219 m (4 ft 0 in); gradient 60%; vertical obstacle 0.914 m (3 ft 0 in); trench 2.59 m (8 ft 6 in)

USA

M1 Abrams Main Battle Tank


The M1 Abrams, with its 105-mm M68 rifled gun, advanced armour and gas turbine, is now operational with the US 7th Army in West Germany. Its fire control system, incorporating thermal sights, laser rangefinder and stabilization system, enables it to engage and destroy enemy tanks in a variety of environmental conditions.

In the 1960s West Germany and the USA started the joint development of a new MBT known as the MBT-70, but this was cancelled in July 1970 for a variety of reasons. The United States then went on to develop a more austere version called the XM803, but this too was soon cancelled as it was felt that it would be too expensive and too sophisticated. Two years later the Detroit Diesel Allison Division of the General Motors Corporation and the Defense Division of the Chrysler Corporation were each awarded contracts to design a new MBT which would have much improved armour protection and greater mobility than the M60 then in production. After extensive trials the design from Chrysler was accepted and in 1976 the company was awarded a full-scale development contract including the construction of 11 pilot vehicles which were completed in 1978. The **XM1** was eventually standardized as the **M1 Abrams** MBT, the first production tank being completed at the Lima Army Tank Plant, Ohio, in 1980. Production started at the Detroit Tank Plant in 1982 and by early 1983 over 700 M1 MBTs had been built and each plant was turning out 30 tanks a month. The US Army has a requirement for 7,058 M1s by fiscal year 1988.

The hull and turret of the M1 are of advanced Chobham type armour and provide the greatest degree of protection ever incorporated into an American MBT. Main armament comprises the proven 105-mm M68 gun as mounted in the current M60 series, but a much improved fire-control system has been installed, this system including a laser rangefinder and thermal imaging system that allows the tank to engage targets by both day and night. The gun is fully stabilized in both elevation and traverse, and so can be aimed and fired while the vehicle moving across country. A total of 55 rounds of 105-mm ammunition is carried, of which 52 are compartmentalized. Of the latter 44 are in the turret bustle (22 on each side) and separated from the crew by sliding doors. A 7.62-mm (0.3-in) machine-gun is mounted co-axially with the main gun, and a similar weapon is mounted at the loader's hatch. The commander has a 0.5-in (12.7-mm) machine-gun that can be traversed through 360° and elevated to +65°. Mounted on each side of the turret is a bank of six smoke dischargers. It is expected that from 1985 production vehicles will be fitted with the 120-mm Rheinmetall smooth-bore gun as already fitted into the Leopard 2 MBT in service with the West German army. These later production vehicles will be designated **M1A1** and will also have a number of other improvements such as additional armour protection.

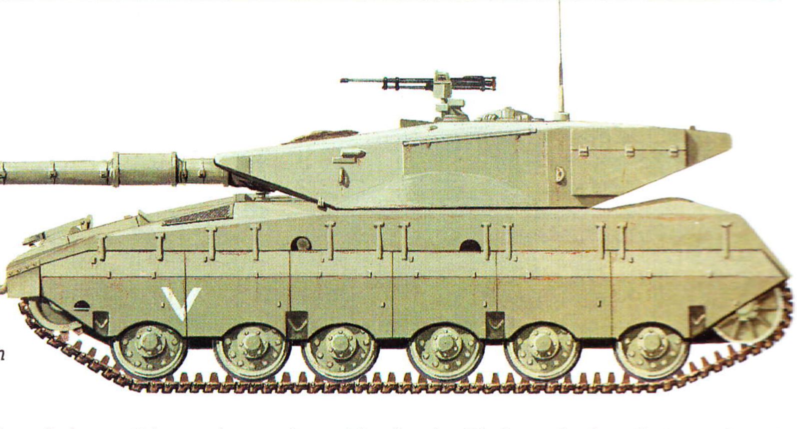
The M1 Abrams MBT is the first such vehicle to be powered by a gas turbine engine, and was installed following trials in an M48 tank. The gas turbine takes up much less room than a diesel, and is easier to service or replace in the field if it breaks down, but it uses more fuel than a diesel engine, a factor which tends to negate the space saved in the first place. The West Germans installed the same gas turbine in the Leopard 2 for trials purposes, but stuck to the MTU diesel for all production vehicles.

Specification

Crew: 4
Weight: 54.432 tonnes
Engine: Avco Lycoming AGT-1500 gas turbine developing 1119 kW (1,500 hp)
Dimensions: length (with gun forward) 9.766 m (32 ft 0½ in); length (hull) 7.918 m (25 ft 11¾ in); width 3.655 m (12 ft 0 in); height (overall) 2.895 m (9 ft 6 in)
Performance: maximum road speed 72.5 km/h (45 mph); maximum range 450 km (280 miles); fording 1.219 m (4 ft 0 in); gradient 60%; vertical obstacle 1.244 m (4 ft 1 in); trench 2.743 m (9 ft 0 in)

ISRAEL

Merkava Main Battle Tank


Israeli army Merkava MBT armed with a 105-mm M68 gun, as fitted to the M48A5 and M60 series of MBT. The Merkava was first used in combat in the 1982 invasion of the Lebanon, when it engaged and defeated Syrian T-72s. It can carry infantrymen, additional ammunition or a number of stretcher patients in the hull rear.

In the 1960s the backbone of the Israeli Armoured Corps was the British-supplied Centurion MBT (which was subsequently rebuilt and fitted with a 105-mm gun to become known as the Upgraded Centurion), Sherman (most of which have now been rebuilt for specialized roles such as command vehicles, ambulances, recovery vehicles, mortar carriers and self-propelled howitzers) and the American M48. After the 1967 Middle East war Israel became concerned that in the future she would not be able to obtain AFVs from her traditional suppliers (the UK, France and the USA). Moreover, many of the tanks from these sources did not meet Israel's unique requirements.

Under the direction of General Tal, Israel started to develop its own MBT, named **Merkava** (or Chariot). This was announced in 1977, and the first production vehicles were completed in 1979. It was estimated that by 1982 at least 250 vehicles had been built. The Merkava was used in action for the first time against Syrian armoured units operating in southern Lebanon in the summer of 1982.

The layout of Merkava is unique in that the whole front of the vehicle is occupied by the engine, transmission, cooling system and fuel tanks. The driver is seated just in front of the turret on the left. The turret, which is of cast and welded construction, is situated well to the rear of the hull with the commander and gunner on the right and the loader on the left. The turret is well sloped to give the greatest possible degree of armour protection and its small cross section makes it a very difficult target. At the rear of the hull is a compartment which can be used to carry additional ammunition or (supposedly) four stretcher patients or 10 fully equipped infantrymen. A hatch is provided in the hull rear to allow for the rapid exit of the tank crew or infantrymen. Standard equipment includes a full range of night-vision equipment, an NBC system and a special fire detection and extinguishing system which is automatically activated when a projectile penetrates the vehicle.

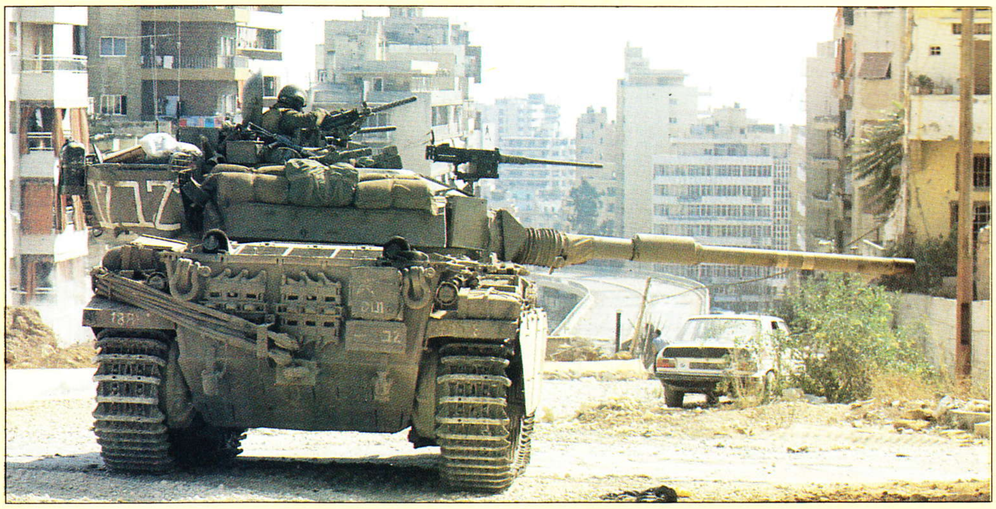
The main armament is the proven 105-mm rifled tank gun, which can fire a wide range of ammunition including the new APFSDS-T round (the M111) developed by Israel Military Industries. During the recent fighting in the Lebanon this round proved capable of penetrating the Soviet T-62 and T-72 MBTs over their frontal arc. The 105-mm gun has an elevation of +20° and a depression of −8.5°. Turret traverse and gun elevation/depression are electro-hydraulic, with manual controls for emergency use. A stabilization system is fitted, enabling the gun to be aimed accurately and fired while the vehicle is moving across country. The Elbit fire control system includes a computer and laser rangefinder.

Compared with other MBTs developed in recent years, the Merkava has a very low speed and poor power-to-weight ratio, but it has been designed for a different tactical situation to that found in Central Europe. It should also be remembered that Israel has had more experience of successful armoured warfare since World War II than any other country. In designing the Merkava the Israelis have placed great emphasis on crew survivability. With a national population of only four million, every trained crew man is a very valuable person who must be given the maximum possible protection.

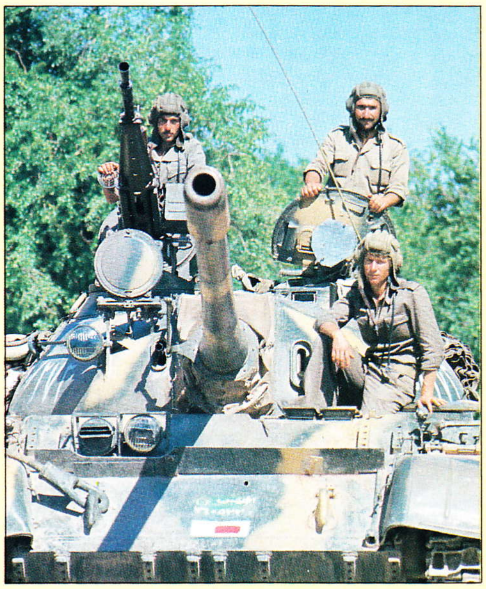
Specification

Crew: 4
Weight: 56 tonnes
Engine: V-12 diesel developing 900 hp (671 kW)
Dimensions: length (with gun forward) 8.36 m (27 ft 5¼ in); length (hull) 7.45 m (24 ft 5¼ in); width 3.72 m (12 ft 2½ in); height (roof) 2.64 m (8 ft 8 in)
Performance: maximum road speed 46 km/h (28.6 mph); maximum range 500 km (311 miles); gradient 60%; vertical obstacle 1 m (3 ft 3⅓ in); trench 3 m (9 ft 10 in)

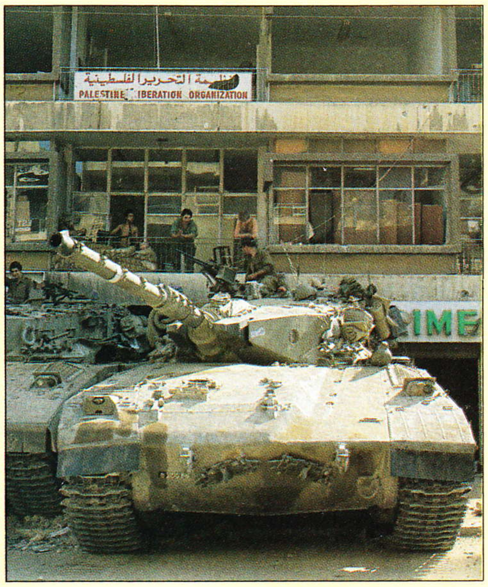
Tank Warfare in the Lebanon



Upgraded Centurion MBT of the Israeli army in Beirut. This tank has two roof-mounted 7.62-mm (0.3-in) MGs and one 12.7-mm (0.5-in) MG over the 105-mm gun to provide the maximum amount of suppressive fire.



T-55 fitted with a full range of infra-red night vision equipment for the commander, gunner and driver.



The Merkava first saw action in the 1982 invasion of the Lebanon. Production has however been very low and only around 200 have been built.

For a number of years PLO (Palestine Liberation Organization) guerrillas had been crossing from southern Lebanon into northern Israel to conduct hit and run raids against Israeli settlements, often causing heavy civilian casualties. On 6 June 1982 the Israel Defence Forces (IDF) launched an attack into southern Lebanon under the codename Operation 'Peace for Galilee'. The advance was led by three regular armoured divisions with some 800 MBTs, supported a number of separate/independent armoured brigades and mechanized and motorized infantry brigades. One division was allocated to the east thrust, one to the centre and one to the west. Two reserve armoured divisions with some 500 MBTs followed the original advance of the regular divisions on 7 and 10 June, with one division covering the eastern sector and the other the central. A further two armoured divisions were mobilized and deployed on the Golan to replace one of the regular divisions which was committed to the Lebanon operation. Additionally, small amphibious landings were conducted along the coastline, and helicopters were used to deploy troops well to the front of the line of advance in blocking positions to stop the guerrillas' line of escape: during Operation 'Litani', conducted in 1978, many guerrillas escaped with their equipment before the Israeli army could make contact, and the lesson had been fully appreciated.

In the 1973 Middle East war the Israeli Armoured Corps lost many tanks as a result of poor co-operation between armour, infantry, artillery and engineer units. The heaviest losses were incurred among tank units, especially on the Sinai front where a number of units were almost wiped out.

Sagger ambushes

In the first few days of Operation 'Peace for Galilee' most Israeli tank casualties were caused by PLO guerrillas ambushing the vehicles with manpack AT-3 'Sagger' missiles and RPG-7 rocket-propelled grenades. Such attacks were generally directed at the most vulnerable parts of the tank, namely its upper parts, sides and rear.

The Syrian army was deployed in the Lebanon in some strength, a number of armoured and mechanized brigades being located in the Bekaa Valley. The Syrians tried to reinforce these with another T-62 armoured brigade from Homs, but on the evening of 9 June this was destroyed by the Israeli air forces while still in transit.

The major armour battle between the Israeli and Syrian armies took place on 10 and 11 June when Syrian MBTs (T-54s, T-55s, T-62s and T-72s) were engaged by Israeli tanks and helicopters armed with Hughes TOW missiles. No firm details of losses are available, although it is believed that Syria lost almost 400 tanks including 270 T-62s, 130 T-54s and T-55s, and as many as 10 of their new T-72s. Israeli losses were under 150 tanks, of which some 40 or 50 were complete losses. Israel deployed the Centurion, M60 series and the Merkava, the last being used in action for the first time. All of these are armed with the combat-proven 105-mm L7/M68 tank gun which fires the new Israeli Military Industries M111 APFSDS-T projectile which has also been adopted by a number of countries in Europe including West Germany and Switzerland. This projectile has a muzzle velocity of over 1450 m (4755 ft) per second and can penetrate 150 mm (5.9 in) of heavy NATO single-target homogeneous rolled steel armour at an angle of 60° at a range of some 2000 m (2,185 yards).

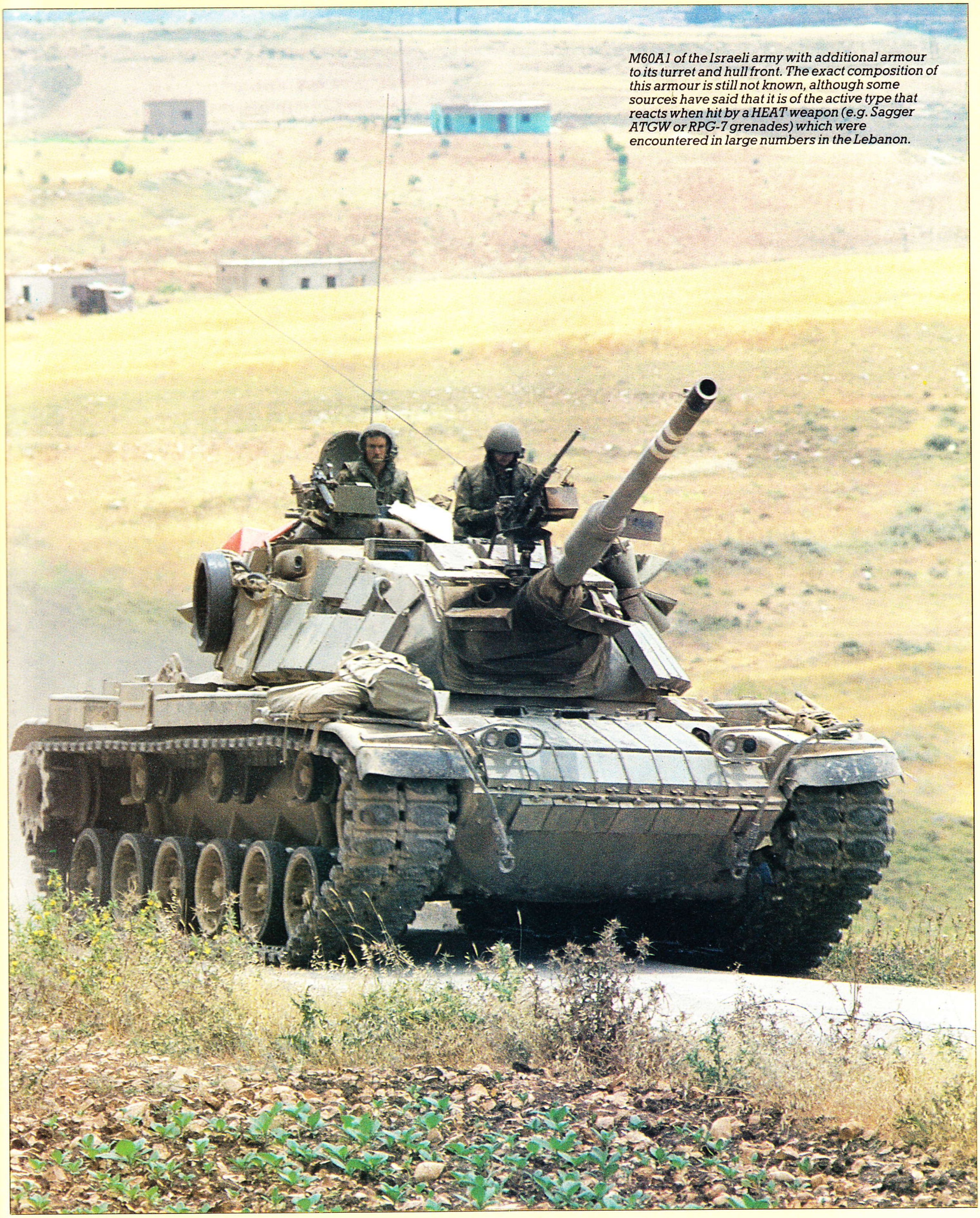
The T-72 was used in combat for the first time in this campaign, and from all accounts it can be knocked out over its frontal arc by 105-mm guns firing the M111 round. There has been much speculation in the West that the frontal armour of the T-72 is of the advanced type incorporating laminate armour impenetrable by any NATO gun projectiles, or even by missiles such as MILAN, HOT and TOW. It could be, however, that the tanks built for export are to a different standard to those issued to members of the Warsaw Pact. The Israelis tried to capture a T-72 MBT for detail examination, but as far as it is known they were not successful.

Israeli supremacy

In tank-versus-tank engagements, the Israeli gunners again proved that they are the best in the world, and few of the Israeli tank losses were caused by penetrations from projectiles fired by Syrian tanks. The Israelis also made better use of the terrain than their opponents even though they were often attacking up very hilly country.

For the Lebanon operation of 1982 many Israeli M60A1s and Centurions were fitted with additional armour protection to their turrets and sides. It is not known if these were ceramic tiles, or hollow boxes to give protection against HEAT projectiles, or active armour. The last consists of a thin layer of explosive which is detonated by the incoming warhead (HEAT, for example) and so disrupts the latter. Some of the tanks were also fitted with what are believed to be launchers for decoy flares to distract Syrian missile systems, including the recently-delivered AT-4 'Spigot' which in the replacement for the 'Sagger'.

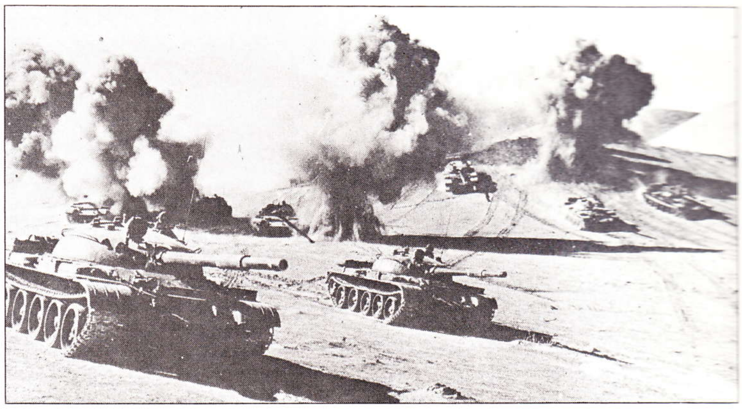
During Operation 'Peace for Galilee' Israeli C^3 (command, communications and control) was first class and the Israel air force soon gained complete air superiority over the battlefield, shooting down some 90 Syrian aircraft for the loss of only two of their own. Extensive use was also made of the IAI Scout and Tadiran Mastiff remotely-piloted vehicles (RPVs) to gather intelligence on the battlefield.



M60A1 of the Israeli army with additional armour to its turret and hull front. The exact composition of this armour is still not known, although some sources have said that it is of the active type that reacts when hit by a HEAT weapon (e.g. Sagger ATGW or RPG-7 grenades) which were encountered in large numbers in the Lebanon.

USSR

T-62 Main Battle Tank



Soviet T-62 tanks advance through an artillery barrage during training exercises. This tank was first used operationally in the Middle East.

The **T-62** is a further development of the T-54/T-55 tank with a slightly longer hull to accommodate the turret with its 115-mm smooth-bore gun. The T-62 was first seen in public during a parade held in Red Square (Moscow) during 1965, although it is now known to have entered production in about 1961. The T-62 remained in production until the early 1970s and a number were also produced under licence in Czechoslovakia, mainly for the export market. The T-62 was more expensive to produce than the earlier T-54/T-55 and for this reason the T-55 remained in production for many years after the more modern T-62 had been phased out of production.

The 115-mm U-5TS smooth-bore gun is fitted with a bore evacuator and is fully stabilized in both elevation and traverse. An unusual feature of the T-62 is that it has an integral shell case ejection system which is activated by the recoil of the gun. This ejects the empty case out through a trapdoor in the turret rear, but this has reduced the rate of fire to about four rounds a minute as the gun has to elevate to +3° 30′ for this to be carried out.

Three main types of ammunition are fired by the 115-mm gun, namely HE-FRAG-FS, or High Explosive Fragmentation Fin-Stabilized, with a muzzle velocity of 750 m (2,460 ft) per second; HEAT-FS, or High Explosive Anti-Tank Fin-Stabilized, with a muzzle velocity of 900 m (2,955 ft) per second and capable of penetrating over 430 mm (16.9 in) of armour at any range; and the deadly APFSDS, or Armour-Piercing Fin-Stabilized Discarding-Sabot, with a muzzle velocity of 1680 m (5,510 ft) per second and a very flat trajectory, and capable of penetrating 330 mm (13 in) of armour at a range of 1000 m (1,095 yards). A total of 40 rounds of 115-mm ammunition is carried, of which four are ready rounds in the turret, and of the rest 16 are to the right of the driver and 20 in the rear of the fighting compartment. A 7.62-mm (0.3-in) PKT machine-gun is mounted co-axially with the main armament; for this weapon 2,500 rounds of ammunition are carried.

Standard equipment on all T-62s includes infra-red night-vision equipment for the commander, gunner and driver, an unditching beam which is carried at the rear of the hull, a turret ventilation system to remove fumes when the gun is fired, a nuclear collective protection system, and the capability of injecting diesel fuel into the exhaust to provide smoke screen. The vehicle carries 675 litres (148.5 Imp gal) of fuel internally with a further 285 litres (63 Imp gal) externally on the running boards, and this total gives the T-62 a road range of 450 km (280 miles). A further two drum-type fuel tanks can be fitted on the hull rear; these each hold some 200 litres (44 Imp gal) of fuel, increasing road range to some 650 km (404 miles). All T-62s can ford rivers to a depth of 5.5 m (18 ft 0½ in) with the aid of a schnorkel erected over the loader's hatch. A centralized fire-extinguisher system is provided for the engine and fighting compartments, and this can be operated automatically or manually by the commander or driver.

Specification

Crew: 4
Weight: 40 tonnes
Engine: V-12 water-cooled diesel developing 580 hp (433 kW)
Dimensions: length (with gun forward) 9.335 m (30 ft 7½ in); length (hull) 6.63 m (21 ft 9 in); width 3.3 m (10 ft 10 in); height 2.395 m (7 ft 10¼ in)
Performance: maximum road speed 50 km (31 mph); maximum road range 650 km (404 miles); gradient 60%; vertical obstacle 0.8 m (2 ft 7½ in); trench 2.85 m (9 ft 4¼ in)

USSR

T-64 Main Battle Tank

The T-64 has only been seen in service with the USSR, and by all accounts has been unsuccessful and was replaced by the much improved T-72.

In the 1960s the Russians built prototypes of a new MBT which became known as the **M-1970** in the West in the absence of any known Soviet designation. This vehicle had a new suspension consisting of six small dual road wheels with the drive sprocket at the rear, idler at the front and four track return rollers supporting the inside of the track only. All previous MBTs designed in the USSR since World War II (the T-54, T-55 and T-62) had been characterized by larger road wheels with no return rollers. The turret of the M-1970 was similar to that of the T-62 and was armed with the same 115-mm smooth-bore gun. Further development of the M-1970 resulted in the **T-64** MBT which was placed in production at one tank plant in the USSR. Production vehicles were armed with a 125-mm gun which was later fitted to the T-62 MBT. So far the T-64 has not been identified as being in service with any other country whereas the later T-72 has been exported on a wide scale, both within the Warsaw Pact and overseas with production now being undertaken both in Czechoslovakia and Poland. Some reports have stated that the T-64 was such a poor design and so plagued with mechanical troubles that it was only in production for a few years, although several thousands were built. The other theory is that the T-64 has advanced armour (especially on the glacis plate) and for this reason was never exported, even to trusted members of the Warsaw Pact.

The layout of the T-64 is similar to that of the T-72, with the driver's compartment at the front, turret in the centre and engine and transmission at the rear. The driver is seated in the centre with a well-shaped glacis plate (probably of laminate armour) to his front. A vee-type splashboard on the glacis plate stops water rushing up when the vehicle is fording a deep stream. When driving in the head-out position, the driver can quickly erect a cover over his position to protect himself against rain and snow.

The turret design is similar to that of the T-72 but is not thought to have advanced armour. The gunner is seated on the left and the tank commander on the right; no loader is required as an automatic loading mechanism is provided for the 125-mm gun, which is assumed to be the same as that of the T-72.

Armament is identical to that of the T-72 and consists of a fully stabilized 125-mm smooth-bore gun, a 7.62-mm (0.3-in) machine-gun co-axial with the main armament, and a 12.7-mm (0.5-in) machine-gun on the commander's cupola. The T-64 has an NBC system and a full range of night-vision equipment and, like most other Russian MBTs, it can be fitted with a front-mounted dozer blade and various types of mine-clearing systems such as roller or plough.

The only known variant is the **T-64K** command vehicle which carries a 10.0 m (32 ft 9⅔ in) high telescopic mast. When erected over the turret, this is held in position by stays that are pegged to the ground, preventing the tank from moving off quickly.

Specification

Crew: 3
Weight: 38 tonnes
Engine: 5-cylinder diesel developing 700 to 750 hp (522 to 560 kW)
Dimensions: length (overall) 9.10 m (29 ft 10¼ in); length (hull) 6.40 m (21 ft 0 in); width (without skirts) 3.38 m (11 ft 1 in); height 2.30 m (7 ft 6½ in)
Performance: maximum road speed 70 km/h (43 mph); maximum range 450 km (280 miles); fording 1.4 m (4 ft 5½ in); gradient 60%; vertical obstacle 0.915 m (3 ft 0 in); trench 2.72 m (8 ft 11 in)

The European Tank Balance

At the heart of East/West insecurity lies the fear that, once again, Europe could witness a repeat of the World War II Blitzkrieg with tank divisions swarming into neighbouring countries. The Soviet Union and her WarPac allies maintain a vast tank superiority over the NATO countries. She holds that they are for defence, but the West is not convinced. Seeing these overwhelming forces pitched against them, NATO considers it can only hold the line for a short time. From then on any battle in Europe would soon escalate to nuclear dimensions.

Belgium has a total of 334 Leopard 1 MBTs (plus specialized vehicles) and about 60 M47 tanks. The latter form a reserve battalion. One mechanized brigade is forward-deployed in West Germany.

Canada has one brigade group based in West Germany, including one tank battalion (or armoured regiment) equipped with a total of 53 Leopard 1A3 MBTs.

Denmark. Total tank strength consists of 120 Leopard 1s and about 90 Centurions with 105-mm L7 series guns.

France. MBTs are used by the armoured division (of which there are eight) and the mechanized infantry divisions (of which there are two). An armoured division includes two tank regiments (each with 54 AMX-30 MBTs) and two mechanized infantry regiments (each with two tank companies of 20 AMX-30s); each armoured division thus has a total of 148 AMX-30 MBTs, totalling 1184 overall. Three armoured divisions are forward-deployed in West Germany.

Italy has 24 brigades, including five armoured, seven mechanized, two independent mechanized and four independent motorized. The armoured divisions each have two armoured and mechanized brigades, the former with two tank battalions and the latter with one. Each tank battalion has 49 MBTs. Total tank strength includes 300 M60A1s, 920 Leopard 1s (plus variants) and a few M47s.

West Germany has a total of 1,232 M48 series MBTs, 2,437 Leopard 1 (MBTs (plus variants) and about 700 Leopard 2 MBTs (out of 1,800 ordered). The regular army consists of 36 brigades including 17 armoured and 15 armoured infantry. Each of the former includes three tank battalions, and the latter each have one tank battalion, each battalion having 41 MBTs. The territorial army includes 12 tank battalions.

The Netherlands has two armoured and four mechanized brigades, one armoured brigade and supporting units being forward-deployed to West Germany. Each armoured brigade includes two tank battalions each with 53 MBTs, while the mechanized brigade has one tank battalion. Total Dutch MBT strength consists of 468 Leopard 1s (plus variants), 368 Centurions, and the first of some 445 Leopard 2s which are to be delivered by 1986.

United Kingdom. The British Army of the Rhine includes nine tank regiments (or battalions) each of which is equipped with a total of 74 Chieftain MBTs, with another two regiments expected to be formed in the mid-1980s. The first of 237 Challenger MBTs were handed over in March 1983, and four of the BAOR's current Chieftain regiments will be converted to the Challenger. Total British Chieftain strength (including reserves) is estimated to be around 900.

United States. The US 7th Army in West Germany includes two armoured and two mechanized divisions and one armoured, one cavalry and one mechanized brigades. Each armoured division normally has six tank battalions and each mechanized vision four tank battalions, each tank battalion having an authorized tank strength of 54 M60A1/M60A3 MBTs. Including vehicles held in reserve or earmarked for use by units currently stationed in the USA, there are about 3,000 American MBTs in West Germany. Several hundred of the new M1 MBTs are now deployed in West Germany.

Czechoslovakia has five motorized rifle and five tank divisions, all organized along Soviet lines. Total tank strength is thought to include about 3,000 T-54/T-55 and 400 T-62/T-72 MBTs.

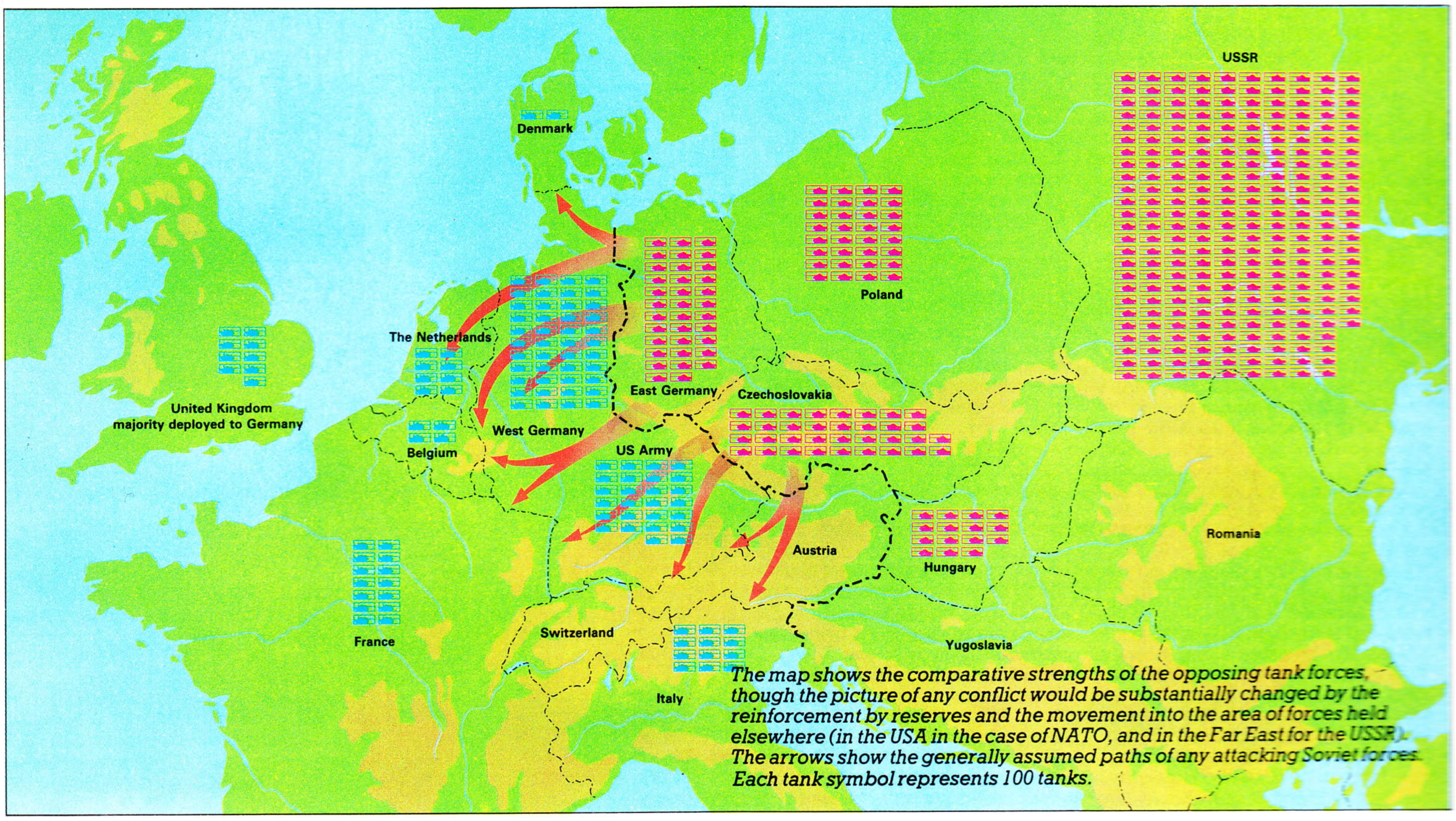
Hungary has one tank and five motorized rifle divisions organized along Soviet lines. Total tank strength is 1,400 T-54/T-55 MBTs, and a small number of the new T-72, which entered service in 1979.

East Germany is one of the best equipped among those of the Warsaw Pact countries, and has four motorized rifle and two tank divisions. Total tank strength is believed to consist of 2,000 T-54/T-55 MBTs, a small number of T-62s, an increasing number of T-72s and about 1,500 T-34/85s used for training or held in reserve.

Poland has five tank and eight motorized rifle divisions organized along Soviet lines. Total tank strength is 3,000 T-54/T-55s, 200 or more T-72s and a few T-34/85 tanks used for training.

The USSR has some 46 tank and 126 motorized rifle divisions, the former each having 328 MBTs and the latter 220 MBTs. Total tank strength is probably at least 50,000 vehicles including the T-54, T-55, T-62, T-64, T-72 and the new T-80. Significant numbers of T-34/85 and obsolescent heavy tanks such as the T-10 are held in reserve.

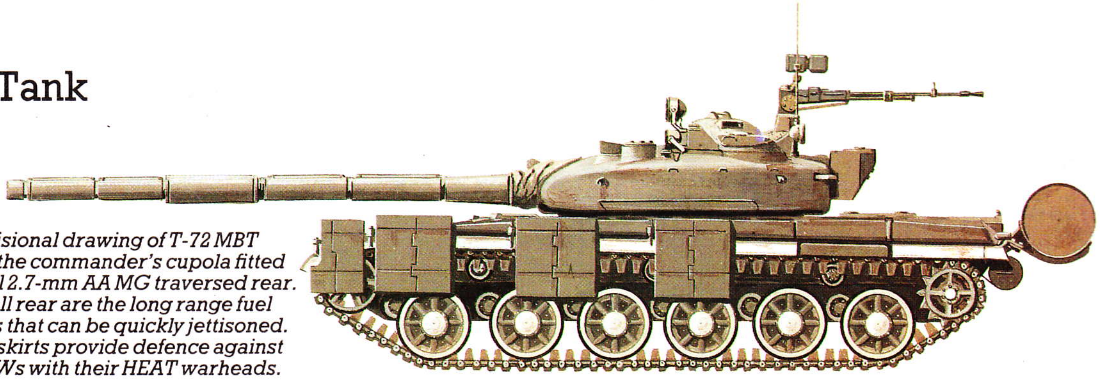
The Soviet divisions are deployed as follows: in East Germany nine tank and 10 motorized rifle, in Poland two tank, in Hungary two tank and two motorized rifle, in Czechoslovakia two tank and three motorized rifle, in the European USSR 23 tank and 40 motorized rifle, in the central USSR one tank and five motorized rifle, in the southern USSR 22 motor rifle and one tank, and along the Chinese border 41 motor rifle and six tank divisions. Units are also deployed in Afghanistan.



The map shows the comparative strengths of the opposing tank forces, though the picture of any conflict would be substantially changed by the reinforcement by reserves and the movement into the area of forces held elsewhere (in the USA in the case of NATO, and in the Far East for the USSR). The arrows show the generally assumed paths of any attacking Soviet forces. Each tank symbol represents 100 tanks.

USSR

T-72 Main Battle Tank



Provisional drawing of T-72 MBT with the commander's cupola fitted with 12.7-mm AA MG traversed rear. At hull rear are the long range fuel tanks that can be quickly jettisoned. Side skirts provide defence against ATGWs with their HEAT warheads.

The T-72 MBT was seen in public for the first time during a parade held in Red Square (Moscow) during November 1977, although it is now known to have entered production in 1971. In April 1978 American reports stated that production of the T-64 and T-72 was running at the rate of some 2,400 units a year and that by 1987 it was expected that a total of 30,000 vehicles would have been built. Since then it is believed that production of the T-64 has in fact stopped and that production is now concentrated on the T-72, with production of the T-80 expected to begin in the near future. Production of the T-72 is also undertaken in Czechoslovakia and Poland and is expected to also be undertaken in India. By 1983 the T-72 was known to be in service with the following countries: Algeria, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, India, Libya, Poland, Romania, Syria and, of course, the USSR. The T-72 was first used in combat by Syria against Israeli armoured units in southern Lebanon during the summer of 1982.

The layout of the T-72 is conventional, with the driver's compartment at the front, the turret in the centre, and the engine and transmission at the rear. The hull may incorporate some type of advanced armour (especially on the glacis plate), although the turret is believed to be of conventional cast steel armour construction. The commander is seated on the right and the gunner on the left, the former being provided with a cupola that can be traversed through 360°, and on this is mounted a 12.7-mm (0.5-in) machine-gun for anti-aircraft defence.

The crew has been reduced to three as an automatic loader, mounted in the lower part of the hull, has enabled the fourth man to be omitted. Full details of the loader are not yet available although it is thought to be similar to a carousel with the projectiles in the lower part and the cartridge, which is believed to have a combustible case, in the upper part. Some reports have indicated that the automatic loader has not proved reliable in service and in some instances has tried to place the gunner in the breech instead of the ammunition! A total of 40 rounds of 125-mm ammunition is carried, a typical load consisting of 12 APFSDS, 22 HE and six HEAT. The APFSDS has a muzzle velocity of 1615 m (5,300 ft) per second and will penetrate 300 mm (11.8 in) of armour at a range of 1000 m (1,095 yards), while the HEAT-FS has a muzzle velocity of 900 m (2,955 ft) per second and will penetrate 475 mm (18.7 in) armour at a similar range. A 7.62-mm (0.3-in) PKT machine-gun is mounted co-axially with the main armament.

The fire-control system includes an optical rangefinder mounted in the forward part of the turret roof, in front of the commander's cupola; more recent production vehicles have a laser rangefinder.

The suspension is of the torsion-bar type, with six large road wheels, the idler at the front, drive sprocket at the rear and three track-return rollers, the last supporting the inside of the track only. When the tank is in action, four spring-loaded skirts are fitted over the forward part of the track on each side and spring forward to give some protection against HEAT attack, notably from missiles.

As on all Russian tanks, long-range fuel tanks can be mounted at the hull rear; in the case of the T-72 these increase its road operating range from 480 km (298 miles) to 700 km (435 miles). Standard equipment includes an NBC system, infra-red night-vision equipment and a schnorkel for deep fording. Mounted under the nose of the T-72 is a dozer blade for clearing obstacles or preparing fire positions.

Although the T-72 is a significant improvement over previous Russian tank designs in terms of firepower and probably armour protection, it is not thought to be superior to the British Challenger or West German Leopard 2 designs on the basis of a one-to-one action; where it does score, however, is that it is already in service in huge numbers whereas the Challenger is only just entering service and only a few hundred Leopard 2s are in service.

Specification

Crew: 3

Weight: 41 tonnes

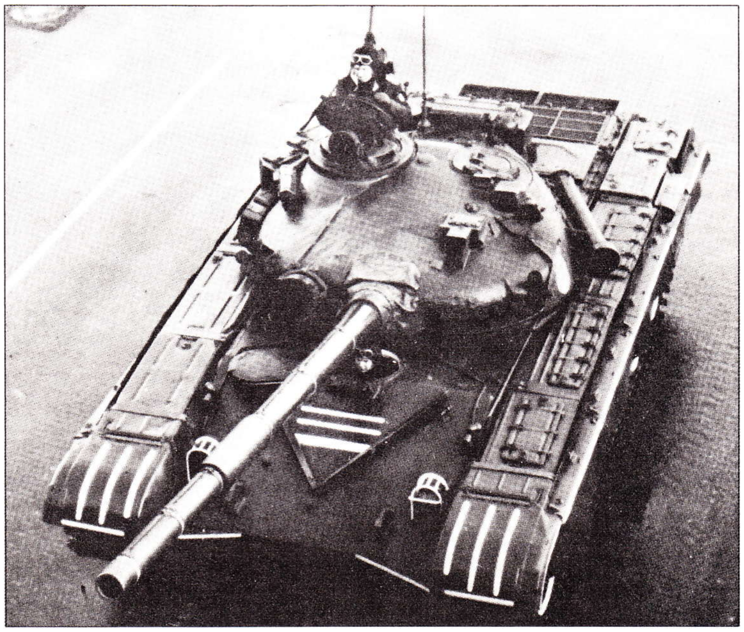
Engine: V-12 diesel developing 780 hp (582-kW)

Dimensions: length (with gun forward) 9.24 m (30 ft 3¾ in); length (hull) 6.95 m (22 ft 9¾ in); width (without skirts) 3.6 m (11 ft 9¾ in); height (without AA MG) 2.37 m (7 ft 9⅓ in)

Performance: maximum road speed 60 km/h (37.25 mph); maximum range 480 km (298 miles); fording 1.4 m (4 ft 7 in); gradient 60%; vertical obstacle 0.915 m (3 ft 0 in); trench 2.9 m (9 ft 2¼ in)

USSR

T-80 Main Battle Tank



In March 1983 the US Department of Defense allocated the T-80 designation to the late production model of the T-72 MBT, although Soviet sources have given the latter the designation T-74.

Since the second half of the 1970s Western intelligence sources have stated that the USSR is about to field a new MBT which has been given the Western designation **T-80**.

According to American reports in both 1979 and 1980 some 200 pre-production T-80 tanks were built for extensive troop trials, with full-scale introduction expected to take place by 1985. There has been some speculation that the T-80 is in fact the T-64 with a new turret incorporating Chobham type armour.

The layout of the T-80 is conventional, with the driver's compartment at the front, turret in the centre, and engine and transmission at the rear. The driver has to his front a well-shaped glacis plate on which is a vee-shaped splashboard to stop water rushing up the glacis plate when the tank is fording rivers, and has a single wide-angle periscope for driving in the closed-down position.

The commander and gunner are seated in the turret, one on each side of the main armament which has an automatic loader, so enabling the T-80's crew to be kept to three men, as in the older T-64 and T-72 MBTs.

It is assumed that the main armament is a further development of the 125-mm gun mounted in the T-64 and T-72. It is thought unlikely that the Russians would introduce yet another gun calibre into their tank fleet as, excluding the PT-76 amphibious light tank (76-mm gun) and T-10 heavy tank (122-mm gun), they already have three different calibres of gun/ammunition, 100-mm in the T-54 and T-55, 115-mm in the T-62 and 125-mm in the T-64 and T-72. It is most probable that the T-80 fires a much improved range of ammunition, and some reports have indicated that this will include an HVAPFSDS (High-Velocity Armour-Piercing Fin-Stabilized Discarding-Sabot) projectile with a depleted-uranium penetrator for improved armour-piercing capability. The gun is fully stabilized and the fire-control sytem probably includes a laser rangefinder which has already been introduced on late production T-72 MBTs. A 7.62-mm (0.3-in) machine-gun is mounted co-axially with the main armament, and a 12.7-mm or 14.5-mm (0.5-in or 0.57-in) machine-gun is mounted on the turret roof for anti-aircraft defence. The value of the latter must be questioned as the chances of hitting a jet aircraft are very small. Mounted on each side of the turret and firing forwards is a bank of four dischargers. As all Soviet tanks have the capability to lay their own smoke screen by injecting diesel fuel into the exhaust, there is some speculation that these (similar dischargers have also been observed on recent production T-72 MBTs) may in fact launch chaff or decoys to confuse NATO missiles such as the MILAN, HOT and TOW.

The suspension of the T-80 is believed to be of the hydro-pneumatic type, and enables the driver to adjust the ground clearance to suit the type of ground being crossed. It consists of six small road wheels with the idler at the front and drive sprocket at the rear. The upper part of the track and the return rollers are covered by skirting; it is not known if these provide armour protection or simply help to keep the dust down.

Specification

Crew: 3

Weight: 48.5 tonnes

Engine: diesel developing 750 hp (560 kW)

Dimensions: length (hull) 7.0 m (22 ft 11⅔ in); width 3.5 m (11 ft 5¾ in); height 2.3 m (7 ft 6½ in)

Performance: maximum road speed 70 km/h (43.5 mph); range 450 km (280 miles); gradient 60%; vertical obstacle 0.92 m (2 ft 11½ in); trench 2.8 m (9 ft 2½ in)

(Note the above specifications are provisional)

Oman

For much of its existence Oman relied on the United Kingdom for its external defence, but from 1963 there was a rebellion in Dhofar province. The withdrawal of British forces from the Middle East in 1967 led to the establishment of the Popular Democratic Republic of Yemen (PDRY) in Aden, who backed the guerrilla factions in the Dhofar area. The Popular Front for the Liberation of Oman (PFLO) was formed with the backing of the PDRY and with considerable assistance in the form of arms and supplies from China and Iraq. In July 1970 the Sultan Qabus overthrew his old father in a coup and this led to a rapid expansion of the Sultan's Armed Forces (SAF), which until then was essentially a mercenary force led by British contract officers. From 1973 a complete Iranian brigade started to operate in the Dhofar area together with their logistic support and helicopters. Northrop F-5 fighters and radars were also supplied and manned by Iran, pending the arrival from the United Kingdom of 12 SEPECAT Jaguar fighter/bombers. The arrival of the Iranian forces and expansion of the armed forces, including the increasing number of locals, led to the gradual pushing-back of the PFLO into South Yemen. By the mid-1970s the war was essentially over, and since then there has been very little military activity. The Iranian presence started to run down, and by the time of the Iranian Revolution in 1979 less than 1000 troops remained; these have since been replaced by a much smaller number of Egyptian troops.

Oman has a population of just under one million, with the armed forces consisting of less than 20,000, excluding expatriate personnel. There are still many British and Pakistani officers and men on contract, although Omanis are gradually taking over in many units. Defence accounts for a major part of Government expenditure, whose income is almost entirely dependent on oil, though Saudi Arabia continues to provide significant funding for the Omani defence effort.

The Army has a strength of about 15,000 men and consists of two brigade HQs and one Royal Guard Brigade, which together control some three artillery regiments, one signals and one armoured regiments, eight infantry battalions, engineer and parachute squadrons and specialized forces.

Of the artillery regiments, two are light regiments with 25-pounder field guns and Royal Ordnance Factory Nottingham 105-mm light guns, while the medium regiment has Soviet 130-mm M-46 towed guns and American 155-mm M109 self-propelled howitzers. Artillery fire control systems are mainly British, and a number of EMI Cymbeline mortar-locating radars are in use.

Members of the Omani Defence Forces loading Rapier ultra-low-level defence missiles on to the launcher.

A pair of SEPECAT Jaguars of the Sultan of Oman's air force roll down the runway. These aircraft are by far the most potent element in Oman's arsenal

The armoured regiment operates three armoured-car and two tank squadrons. The former are equipped with Alvis Saladin (6×6) armoured cars with a number of Alvis Scorpion CVR(T)s recently introduced, while the latter are equipped with six American M60A1 and 12 ex-British army Chieftain MBTs. The latter are on loan, while 15 new vehicles are being built at Royal Ordnance Factory Leeds; these have a number of modifications requested by Oman, and are known as the Qayis Al Ardh.

Infantry equipment is of Western origin and includes 9-mm Browning pistols; 9-mm Sterling SMGs; 7.62-mm FAL, 5.56-mm M16A1 and 5.56-mm SIG rifles; 7.62-mm FN MAG GPMG, French Thomson-Brandt 60-mm, British 81-mm L-16 and American M30 4.2-in (107-mm) mortars; and Hughes TOW ATGWs. Armoured personnel carriers include the French VAB and the British AT 105; four Soviet ZSU-23-4 SPAAGs are also in service.

The Omani air force has a strength of about 2,000, plus a high number of expatriate personnel, and has one squadron with 12 Hawker Hunter Mk 73 fighter/ground-attack aircraft, plus Hunter T.Mk 66 and T.Mk 67 trainers (some of the former have a photo-reconnaissance capability); one squadron with the remains of 12 SEPECAT Jaguar fighter-bombers; and one trainer/COIN squadron with 12 BAC One-Eleven, one Dassault-Breguet Falcon 10, seven Britten-Norman Defender, 15 Shorts Skyvan 3MF and three Lockheed C-130H Hercules transport aircraft. Two de Havilland Canada DHC-5D transport aircraft have been ordered. The one helicopter squadron is equipped with some 15 Agusta-Bell AB 205s, two AB 206s and five Bell Model 214s. There is also a Royal Flight with one Grumman Gulfstream, one BAC VC 10, one Douglas DC-8, two FWA AS.202s and four Agusta-Bell AB 212 helicopters. Air defence weapons consist of 28 British Aerospace Rapier missile launchers and a similar number of Marconi Space and Defence Systems Blindfire radars to give an all-weather capability.

The navy has a strength of 1500 and has recently completed a major re-equipment programme; the main operating base is Muscat, with advanced bases at Mina Raysut and Jazirat. Craft include a Royal Yacht which has been fitted with a helicopter pad and also carries a Fairey Marine Spear patrol craft. The three new Vosper Thornycroft 56-metre Province fast-attack craft are armed with a single 76-mm OTO Melara Compact gun forward, twin Breda anti-aircraft guns aft, the latest fire control systems and six Exocet surface-to-surface missiles. The two Brooke Marine fast-attack craft missiles were completed in 1973 and are armed with twin 40-mm Breda guns forward and two launchers for Exocet surface-to-surface missiles aft. There were originally three ships in this class, but one was lost overboard in the Bay of Biscay in 1978 while being shipped back to Oman after a major refit. There are also four Brooke Marine Fast Attack Craft (Gun), which were all commissioned in 1977 and are armed with a single 76-mm OTO Melara Compact gun forward and a single 20-mm Oerlikon cannon aft. The Landing Ship Logistic was commissioned in 1979 and has a crew of 47 and can carry up to 188 troops as well as armoured vehicles and trucks. Armament consists of a 76-mm OTO Melara Compact gun forward, and two 20-mm cannon. A helicopter deck is fitted aft, and two Rotork landing craft are carried. In addition the navy has some six landing craft, three British Skima-12 hovercraft and other support craft.

In addition to the regular forces there is also the tribal Home Guard (the Firqats) with a strength of over 3000 men, as well as a police Marine Wing and an Air Wing.

Order of Battle

Army
One Royal Guard Brigade
Eight infantry battalions
One medium and two light artillery regiments (M109 155-mm SP howitzers and 105-mm light guns)
One armoured regiment (Saladin and Scorpion reconnaissance vehicles, M60A1 and Chieftain MBTs)
One signal regiment
One parachute squadron
Specialized troops

Air Force
One fighter-bomber squadron (SEPECAT Jaguar)
One fighter-bomber/reconnaissance squadron (Hawker Hunter)
One COIN/training squadron (BAC Strikemaster)
Three transport squadrons (BAC One-Eleven, Lockheed C-130, Britten-Norman Defender, Shorts Skyvan, Dassault-Breguet Falcon)
One helicopter squadron (Agusta-Bell AB 205 and AB 206, Bell Model 214)
One Royal Flight (BAC VC-10, Douglas DC-8, Grumman Gulfstream, FWA AS.202, Agusta-Bell AB 212)
Two air defence squadrons (Rapier with Blindfire)

Navy
One Royal Yacht/Corvette
One logistic landing ship
Five fast attack craft (missile)
Four fast attack craft (gun)
Support vessels